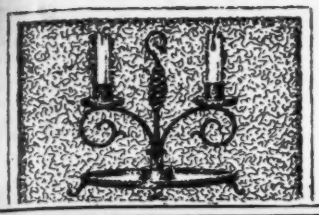

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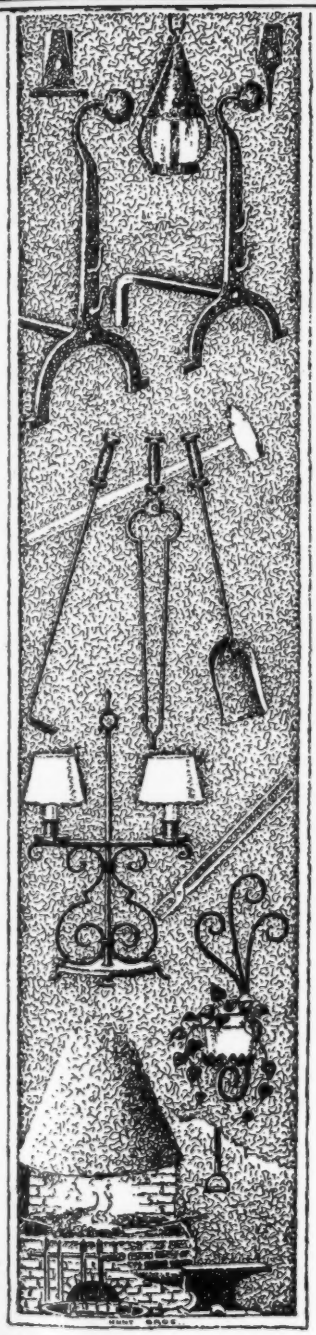

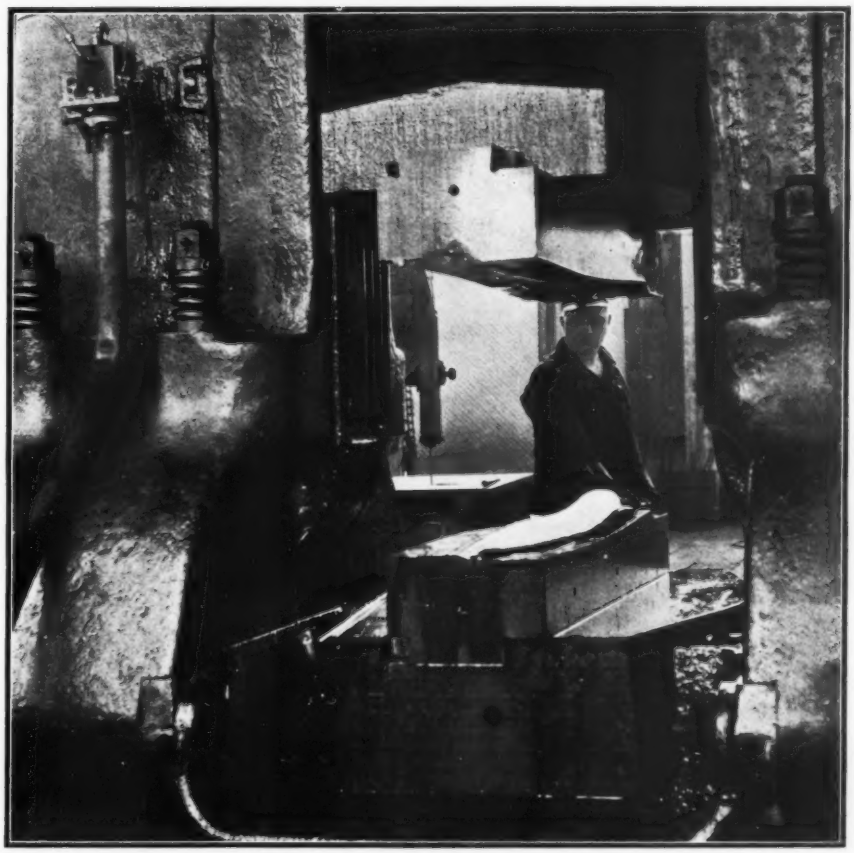

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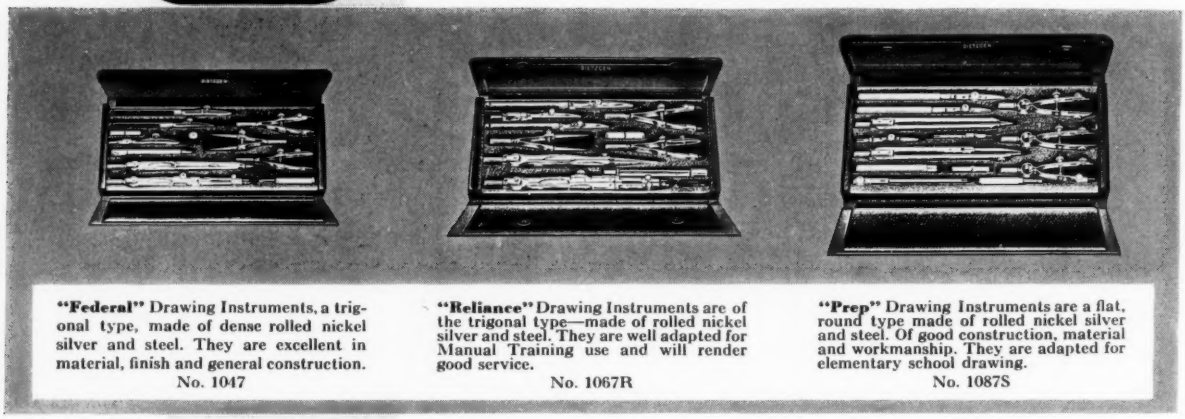

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

May, 1934
Vol. 23, No. 5

Industrial Education and This Age[1]

Arthur B. Mays

Professor of Industrial Education,
University of Illinois, Urbana, Illinois

This article portrays the changes which the dawning of the new day, affecting as it does the economic and industrial fabric of our civilization, will likely bring about in industrial education.

ONE of the clearest lessons taught by history is that few great changes in human development occur suddenly, and the peoples who are undergoing the most fundamental and revolutionary transformations rarely are aware of the significance of what is happening to them. But as civilization moves farther along its destined way, the speed with which changes occur seems constantly to accelerate, and increasingly civilized peoples are becoming reconciled to the possibilities of frequent change of a fundamental character. Hence, today every thinking person is keenly aware of new movements, new conditioning factors and impending changes which promise to modify every vital aspect of contemporary life; and all are earnestly trying to penetrate the mists which envelop the scene ahead to know how best to prepare for the new day which seems both inevitable and imminent.

With the limitations of vision which handicap us, the only means available for perceiving probable future conditions is to relate present-day life to that of a comparable period of the past, and from this relationship to try to determine the direction in which we seem to be moving. As we thus turn the pages of the years that are behind us, seeking for pictures resembling the scenes of the present, we unhesitatingly choose the decades immediately following the great Civil War, for those years exhibit conditions strikingly similar to those of today, and the consequences of conditions then existing are highly suggestive of what we may expect during the next two or three decades. In some respects the years between 1870 and 1890 are the most remarkable in all our history. The country had just emerged from a terrible war that had taxed the strength of the nation, but it also had served to stimulate industry and commerce, in a large part of the country, to a vigor and growth undreamed of during the relatively leisurely years before 1860. Transportation, building, and manufacture grew with unprecedented speed, and the old spirit of adventure which had, hitherto, expressed itself in pioneering, exploration, and Indian fighting in the little-known West, now discharged its energy in the creating of great commercial and industrial projects. But the expansion of credit and the unrestrained optimism and recklessness of that frenzied era produced their inevitable fruits, and the whole country was plunged, during 1873, into the darkness and utter despair of an awful panic and depression, a depression, in almost all its details, amazingly like the one from which we are now beginning to emerge. But it was what happened during and immediately following the depression that laid the foundations of American industrial supremacy, and transformed both the economic and social life of the nation from one having all the characteristics of the traditional rural country to what we call Modern America. It was during the years between 1873 and 1890 that most of the marvelous mechanical inventions and economic devices, which give to our day its characteristic tone and quality, were produced. Every aspect of the national life was changed and every basic institution was altered. Our country became for the first time an industrial nation having its standards dictated by the great industrial city with its noisy conflicts and bewildering social, cultural, and economic complexities. The industrial developments of that notable epoch are too well known to need another repetition in detail; almost every mechanical necessity and luxury familiar to modern life came to us out of those years of discovery, invention, and creation. And it was during those years that the modern movement of industrial education was born.

Organized, purposeful industrial education came both as an educational reform and as an answer to a great economic need. It brought a new life and vigor to the schools, and played a large part in the transformation of the schools of this nation from institutions for the special education of the privileged few to popular and effective agencies of universal, democratic education. It contributed in no small measure to the development of a school system which has been able to lift the common level of a great nation to a height never before reached in the history of civilization, and which enabled this people to weather the recent economic storm without revolution or even a serious disturbance. And now once more the nation faces a new day and we shall be wise to consider carefully what the signs are; and, as students of industrial education to try to prepare for the approaching changes which may be indicated.

As in the 1870's, 1880's and 1890's, so today great new industries and mechanical developments are in the making. We have become so accustomed to the announcement of new mechanical wonders and the rise of new industrial developments that we scarcely notice the amazing progress that is being made, day by day, before our eyes. Indeed, it is probable that we are too close to our day fully to realize the magnitude and meaning of the changes which are occurring. Is it too much to expect that the great Century of Progress Exposition will prove to be as epoch-making in the realms of industry and education as was that other marvelous centennial exposition, the World's Fair of 1876? That event marked the end of an age for us, and the beginning of Modern America. The signs are not lacking which point to this year's being the first stage of another new industrial era. Consider, for example, only four or five of the most familiar fields of industry represented in the Century of Progress Exposition;

[1]Address given before the industrial education section of the National Education Association, July 5, 1933.

namely, aviation, rail transportation, communications, the automobile, and electric illumination. Each one of these great fields of human achievement is clearly just upon the threshold of almost unimaginable developments. That important new industries requiring hundreds of thousands of trained workers are soon to be created to supply the needs of aviation seems assured, and whole new areas of manufacture in related industries are likely to be developed. New inventions designed to contribute to the safety and efficiency of air transportation are being announced with remarkable frequency. That the clumsy, noisy, and almost unbelievably inefficient steam locomotive and the overweight, overheated, poorly ventilated, dusty, uncomfortable railway coach and sleeping car are doomed to oblivion is too obvious for comment, and there are already signs of a new era of invention and manufacture in the field of railway equipment. The conditions of modern life make such a change inevitable. The radio and its offspring, the wireless telephone and television, are yet in the experimental stage with the future literally bristling with possibilities. And new worlds of color and beauty are already appearing on the horizon in the direction of the science and art of artificial illumination. As for the automobile, there is ample evidence for the belief that the end of its development is yet far in the future. These are but suggestions of what appear as probabilities of the near future in only a few of the most easily seen areas and are but tokens of what is going on all about us in many less-familiar fields. The next three decades may see our nation once more completely revolutionized in its economic and social life.

Industrial Education of the New Day

We, who teach industrial subjects are, however, concerned primarily with the possible changes in industrial education in the new day facing us. Will technological developments eliminate the need for human skill and technical knowledge? Obviously they will not. The probabilities are just the opposite. Skills will change, old occupations requiring skill will die, and others will be split up into narrow specialties, as in all the past. But also, as in all the past, new occupations requiring skill are sure to rise. Both the consumer and the producer of industrial products will increasingly need both skill and technical knowledge. Every essential factor in modern life implies the increasing exercise of skill and the conscious application of science to the daily work of the world. In fact, blundering, amateurish work is less tolerated today than in any previous period of history, and the increasing tempo of life suggests that the lack of expert skill and technical knowledge will be increasingly penalized by society. In industry there is a constantly growing need for technical intelligence, and for versatility both in manual and mental skills. The alarmist pronouncements of the "technocrats" have led many to hurried conclusions which will not bear close examination. It is quite probable that there is a point in the technological development of any given industry beyond which the law of diminishing returns serves to check very sharply the substitution of machines for men. Dean Dexter S. Kimball,[2] of the College of Engineering in Cornell University, in a paper read last year before the American Association for the Advancement of Science, said of this matter, ". . . there are good reasons for believing that there are economic limitations to the growth in the size of manufacturing enterprises, and consequently to the efficiency of mass production itself. Indeed, if the facts were known, it probably would be found that many modern industrial enterprises have already passed the point of greatest efficiency and greatest economic returns. The value of the industrial product per worker in this country in 1900 was about $1,600, while in 1919 (the last census in which such data are available) this ratio had risen to $7,500. Making due allowance for the changed value of the dollar, this is a great gain in production per worker. But *the ratio of the value of products to the capital invested has decreased* steadily for a number of years. In 1850 this ratio was close to 2, but it fell progressively until in 1919 it was only 1.39. This would appear to indicate that even if the number of workers is materially reduced in favor of more refined machinery, the cost of production will eventually rise with increased complexity of mechanisms. This is already foreshadowed in some industries where the fully automatic machine as yet is not so economical as the semiautomatic operated by a skilled worker. Barring some new and eruptive change like the Industrial Revolution, there is little likelihood of startling changes in the immediate future."

In any case, it is clear that as processes and machines become progressively more complex and rapid the safety of materials, machines, and men requires intelligence, judgment, and skill in increasing degrees on the part of those who operate machines as well as those who repair and those who direct. American industry learns with amazing slowness all its lessons which pertain to its personnel, but at long last it is beginning to see the extravagance of labor that is cheap because it is untrained and lacking in judgment and understanding. Partly for this reason it is refusing, increasingly, to employ children, and more than ever before in its history it is giving attention to programs of personnel training. The census figures dealing with the employment of children are impressive. Since 1910 the percentage of children from 10 to 15 years of age gainfully employed has decreased from 18.4 per cent to 4.7 per cent. These figures not only suggest the growing need for maturity of judgment in even the lowest levels of work, but they point clearly to a changing attitude toward child labor which is even now producing a revolution in the constitution and policies of the public school. The changes thus being wrought in the schools offer a greatly enlarged opportunity for vital service to industrial education and a challenge to greater effectiveness in its methods and programs of instruction.

At the upper levels of industry, the highly technical nature of nearly every division of work requires increasingly exacting technical training of an order never before demanded by manufacturing processes; and the insistent demand for improvement in both process and product places a premium upon the highest possible technical efficiency. An observant professor of engineering with years of experience in railroad work said to me recently, that the chief reason for the almost unbelievable backwardness of the American railroads is that they have clung to their stupid system of seniority promotions throughout a period of industrial progress when nearly every other industry has brought in from the colleges large numbers of highly trained men, and have developed highly skilled staffs of research and development experts. This, indeed, is the spirit of the new day, and specialized technical knowledge based upon broad foundations of general and technical education seem to be the requisites for advancement in modern industry. High technical efficiency is not only a need of engineers and research scientists, but increasingly it is needed by those who purchase, who install, who repair, and who supervise the operation of machines and industrial appliances which are the products of research and refined technical development. Not only must specialized knowledge be greater but the breadth of understanding upon which it is built must be greater. It is from the breadth of technical understanding and variety of experiences that both judgment and versatility are derived, and these are the prime requisites of modern industry.

Versatility in industrial workers will very probably be a highly important quality in the new day toward which we are moving. Sudden changes of processes and of products have become almost the rule in the modern factory, and the worker, of whatever level, who is unable to adjust himself quickly to new tasks and conditions of labor is of little value

[2]Kimball, Dexter S., "The Social Effects of Mass Production," *Mechanical Engineering*, Feb., 1933, pp. 83–89.

in this period of economic history. Hence, the too narrowly trained worker without the resources which give ready adaptability to new conditions may at any time find himself walking the streets vainly seeking employment even during the most prosperous times. It is this demand for *versatility* and *intelligence* which constitutes the most significant new factor to be dealt with by industrial education as we face the new day.

Dr. Woodward's Vision

When the modern industrial-education movement took definite form during the 1880's and 1890's, curiously enough, among its aims were the very qualities here set forth as constituting the new factor to be dealt with. Dr. Woodward insisted on a type of training that combined manual and mental education in such a fashion that the products of the schools could fit effectively into any work in industry they might choose to do. The vocational-education movement, which got under way during the first decade of this century, stressed specific training for specific jobs. But now we face once more the earlier situation which the fathers of the old manual-training movement sensed in their day. There are, however, certain new conditions to be met in the present and the probable future. Among them are, the large numbers to be taught and trained, the rapid change in industry, and the progressive increase in the application of science to productive processes. Hence we seem, today, to face the need for a type of industrial education which is fully cognizant of, and in step with, the determining factors of modern industry, but which has much the same philosophy underlying it which the leaders of the 1880's possessed and upon which they established the modern industrial-education movement.

Much progress has been made in the field of industrial education since the manual-training movement was inaugurated in 1880. The details of its history need not be recited here, but an understanding of its more fundamental developments is essential in any effort to determine the directions of growth most desirable for the years immediately ahead of us. The more one considers the conception of industrial education expressed by Dr. Woodward and the other leaders of his day, the more impressed is one with their essential soundness for the present day and the probable future. It should be recalled that Woodward was an engineer fully aware of the character of American industry and amply able to visualize the probable directions of its growth. His concept of careful, analytical study of mechanical processes to the end that the graduate of the school shop would be equipped with technical understanding, skill, and the habit of analysis is precisely what is needed today. His other concept of training in basic or fundamental processes in several fields of work leads to the only type of training that insures versatility. Industrial versatility was one of his objectives and it must be ours. Manual training, however, suffered in the hands of teachers and administrators who did not possess either Woodward's vision or philosophy; and a too great emphasis upon mere handwork and the production of interesting objects led to a weakening of the value of manual training and to the rise of the vocational-education movement which was antagonistic to the earlier movement. The new movement stressed skill and the specific training needs of industry. Unfortunately the manual-training movement and the vocational-education movement remained antagonistic for a quarter of a century, developing almost wholly independently of each other. But notwithstanding this attitude of the one toward the other, each was inevitably influenced by the other. Manual training gradually regained much of the educative effect of analysis of process, which Woodward insisted on, and besides acquired a richness of content and variety of experiences far exceeding anything he attempted. Meanwhile specific vocational-industrial training both through contact with the general schools and by virtue of the increasing technical nature of industry itself also acquired a greater educative content. Both divisions of industrial education have become enriched in content and more effective in procedure during the years just passed, and they differ chiefly today in (1) the period of life of the learner involved, (2) the intensiveness of the training, and (3) the immediate objectives. We now think of the one as general, educative, and basic, and of the other as specific, intensive, and preparing for immediate use in a particular job. Now, modern industry, and very probably the industry of the new day, greatly need both these types of industrial education. Hence it appears that the immediate problem of industrial education as it faces the new day is that of an intelligent coördination of the two great movements of industrial education each of which has already so heavily contributed in its own realm to modern education and modern economic progress.

The need seems now to be for a still more enriched form of industrial arts, or general industrial education, which through its teaching of technical facts will make for technical understanding and intelligent adjustment to modern industrial requirements, and which, through a richer, more varied range of industrial experiences, will produce the necessary versatility of the worker who must constantly face the possibility of sudden change. Upon the foundations laid by an enriched school industrial arts we can build various sorts of highly specialized training for specific jobs, as the need arises in the life of the individual worker. The two great movements need only to merge in proper relationship to give us the requisite means of meeting the industrial-education needs of the new day.

We face the new day with ample means of meeting adequately its industrial-education requirements, if only we see the problem clearly, and are both able and willing so to reorganize and inform our program of study and work as to produce the requisite technical understanding and industrial versatility. Let us, then, recast the industrial-arts courses of our junior and senior high schools so that they will contain much more richness of scientific and technical material which will be taught in close relationship to the manual processes performed. Let us teach something of the social and economic meanings of the processes and products of the school shop and of industry. Let us give more attention to the development of habits of analysis and achievement and the growth of self-confidence and the powers of self-improvement. Let us enlarge the range of experiences provided in the school shops and drafting rooms to the end that breadth of understanding and versatility may be acquired. When the proper time in a young person's career for specialization arrives, let us build it upon broad foundations more quickly and efficiently than we now do. Let us provide more generally for the rapid retraining and effective extension of knowledge of adult workers who are unable quickly to adjust themselves to the swiftly occurring changes of industry and modern society. And let us coördinate all the nation's resources of industrial education, both those of the schools and those of the trades and industries, for the training of all workers at all levels and of all ages and conditions.

If we do these things we shall, doubtless, be able to face the new day with confidence and the feeling that industrial education is fully alive to the trends and needs of this most interesting and pregnant age of all history.

IDEALS

Men are governed by their ideals; and a new epoch begins when a lower and selfish ideal is displaced by a higher and nobler one. And work gains in dignity, and is sure to be better done, when the worker is inspired by the higher ideal and motive. Love is the secret of all perfection and workmanship. — *J. M. Lewes.*

Planning Industrial-Arts Courses

Glen U. Cleeton

Carnegie Institute of Technology, Pittsburgh, Pennsylvania

Considerations which ought to be kept in mind by those who are engaged in planning courses for the school shop.

ONE who undertakes the task of planning courses of study in industrial arts is immediately confronted with differences of opinion as to the purpose of instruction in industrial arts, because the respective points of view of teachers, pupils, school administrators, and leaders in educational thought present such a wide variance. This presentation is an attempt to show how courses of study in industrial arts may be prepared which will harmonize the several viewpoints indicated.

The Different Viewpoints

Leaders in educational thought and alert school administrative officials look upon industrial arts as a branch of general education. They believe that industrial arts should be included in public-school curricula for the same reasons that they use in justifying instruction in language arts, number arts, graphic arts, music, history, geography, literature, and science. All subjects in the program of general education reflect important elements in modern civilization. The study of industrial arts is, therefore, justified as a part of the general program of education because of the place of constructive and mechanic arts in modern life. Any subject of instruction can be justified as curricular material which provides opportunities for pupil self-discovery and self-development in an activity upon which society places value.

Every teacher of industrial-arts subjects attempts to develop a limited number of industrial skills related to trade and industrial production activities. The skills ordinarily sought are those which can be used by pupils in practical mechanics, home repairwork, and avocational activities, and which may serve later as a basis for instruction leading to participation in industrial vocations.

To a greater or less degree teachers of industrial arts place emphasis on the following purposes of shop instruction:

1. To provide a better understanding of industrial occupations.
2. To promote knowledge of the social significance of industry.
3. To develop ability to judge the quality of industrial products.
4. To provide an opportunity for mental and physical growth through the manipulation of various types of raw materials.

Pupils study school subjects primarily because of interest. An opportunity to do something interesting is the chief objective of any school subject for pupils below the senior-high-school level. Lacking a course plan which makes due allowance for the interest factor, the teacher must resort to artifice or force. The pupil then submits to the lesser of two evils as he sees the situation and serves time.

The Problem Stated Briefly

With the diversity of perspective indicated in the foregoing, how shall courses of study in industrial arts be organized that will reconcile the viewpoints of all concerned? The following statements, rules, and principles suggest how this problem may be solved:

Select Interesting Projects

A. Shop projects which are based on play and recreative activities possess high interest value. One of the best sources of information on play activities of children of different age levels is *Psychology of Play Activities,* by Harvey C. Lehman, and Paul A. Witty.[1] Information from this and similar sources should be supplemented by study of local conditions so that the teacher may relate projects to play life. An example of such an attempt is the course of study in industrial arts developed at Cincinnati, Ohio. Children's magazines, boycraft books, scout manuals, etc., will be found to be helpful as supplementary sources. A comprehensive list of projects is contained in *Reconstruction of Industrial Arts Courses,*[2] pp. 102–109, by David Snedden, W. E. Warner and others.

B. Pupils enjoy making things for other people whom they like or admire. This principle has limited application since children do not care to have all their time monopolized by such work.

C. Pupils like to imitate constructive activities of adults. If this principle is applied, visits to industrial plants and construction jobs should precede construction of imitative projects.

D. Competition may be used in an effective manner at times.

Determine the Minimum Skill Essentials

A. The basic elements in all forms of industrial education are trade and industrial production operations. From a complete analysis of the trade or industrial job series, those operations suitable for use with particular age or grade groups should be selected. An important step in this direction is being taken by a committee of the American Vocational Association. Tentative analyses prepared by this committee may be found in the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine for May, 1931, and in later issues. Printed reports containing these analyses also may be obtained from the secretary of the American Vocational Association.

B. Practical-mechanics needs, indicate significant skills which are worth developing. Investigations reported in the following sources are suggestive:

Bobbitt, Franklin, *How to Make a Curriculum,*[3] pp. 186–193.

Charters, W. W., *Curriculum Construction,*[4] pp. 272–307.

Newkirk, L. V., *Validating and Testing Home Mechanics Content,* Bulletin 201, Studies in Education, University of Iowa.

Wakeling, Arthur (editor), *Fix It Yourself.*[5]

C. The minimum skills selected as essentials should be inculcated by means of instruction on interesting projects.

Interpretation and Correlation Necessary

A. Occupational information and technical information, to a certain extent, should be included in course outlines for industrial arts. Project-skill instruction should be interpreted for the pupil. Suitable material will be found in such books as:

[1]Published by A. S. Barnes and Co., New York, N. Y.
[2]Published by Columbia University, New York, N. Y.
[3]Published by Houghton Mifflin Co., Boston, Mass.
[4]Published by The Macmillan Company, New York, N. Y.
[5]Published by Popular Science Publishing Co., New York, N. Y.

Cooley, R. L., Rodgers, R. H., and Belman, H. S.: *My Life Work* series.[6]

Lane, May Rodgers, *Vocations in Industry*.[7]

Proctor, W. M., *Vocations*.[8]

Rodgers, R. H., *Trade Foundations*.[9]

B. Various qualities of well-made products of the type covered by shop instruction should be brought to the attention of pupils. Such instruction should include both commercially produced articles and projects made by the pupils. Use material such as that contained in:

Consumers Research, Inc., 340 West 23rd St., New York, Current bulletins.

Harap, Henry, *Education of the Consumer*.[10]

Kelsey, Clark B., *Furniture: Its Selection and Use*.[11]

C. Determine correlation possibilities between other school subjects and industrial-arts instruction. Include at least the mathematics, science, and drawing correlations in the course outline. This is well illustrated by the St. Cloud, Minnesota, course of study in manual arts in the junior high school, by John F. Friese and others.

Summary

It should be obvious that no mere list of projects is sufficient as an industrial-arts course outline. At least the following elements should be included:

1. Name of project or job.
2. Operations involved.

a) List first those about which the pupil has a good understanding.

b) Those to be reviewed.

c) Those to be presented for the first time.

3. Tools, materials, and equipment to be used.
4. Relation to pupil activities and possible practical applications.
5. Technical information to be taught, directly stated or reference material suggested.
6. Skill in, and knowledge of, drawing required.
7. Related mathematics, science, and other subject correlation.

a) That which is indispensable.

b) Desirable but not indispensable.

8. Occupational information.

a) References to printed material.

b) Available motion pictures.

c) Group plant visits.

d) Individual plant visits.

9. Sources of information which will aid judgment of quality of articles produced and similar commercial products.

The sources referred to in this article have been found helpful by the writer. They have been chosen as references because they illustrate the points emphasized. Many others, probably equally good, might have been included.

[6]Published by McGraw-Hill Book Company, New York, N. Y.
[7]Published by International Textbook Co., Scranton, Pa.
[8]Published by Houghton Mifflin Co., Boston, Mass.
[9]Published by The Manual Arts Press, Peoria, Ill.
[10]Published by The Macmillan Co., New York, N. Y.
[11]Published by U. S. Department of Commerce, Washington, D. C.

Scholarship and Position Held

Louis F. Hillman

Formerly Professor of Education and Director of Educational Training, Hanover College, Hanover, Indiana

An abstract of a study submitted by the author as a thesis in partial fulfillment of the work required for a doctor's degree at Indiana University.

THIS study seeks to show whether a greater number of graduates with high scholarship hold more desirable, important, or responsible positions than do the graduates with low scholarship. In order to show this, the writer has selected from the large list of different positions held by the four scholarship groups[1] the eight positions which seem to him the more desirable, important, and responsible ones. These eight positions are seldom held by beginners, but are generally secured only after ability and judgment in an inferior vocation have been demonstrated. These positions are:

a) Professor in a college and research worker.
b) Superintendent of schools.
c) Principal of a school.
d) Judge of a court.
e) Army officer.
f) City official, such as health officer, etc.
g) Banker (president, vice-president, or cashier).
h) Manager (in store, firm, or large corporation).

All of these eight positions might be considered promotions, and are generally looked upon as important and desirable since they carry a certain amount of responsibility. The data needed to show how and what per cent of the men and women of each scholarship group are holding any of the eight positions referred to have been assembled from the scholarship tables throughout the study. The data appear for each group separately in the following table:

Table I — Number and Per Cent of Each Scholarship Group Holding the Eight Kinds of Positions*

Kind of Position	Men								Women							
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
	Quartile								Quartile							
	4		3		2		1		4		3		2		1	
Professors and Research Workers	70	13.9	34	6.4	22	3.8	11	1.6	8	2.1	0	0	1	.3	1	.4
Superintendents of Schools	17	3.3	6	1.1	5	.9	6	.8	2	.5	0	0	0	0	0	0
Principals of Schools	23	4.6	20	3.7	25	4.3	18	2.6	4	1.1	1	.3	1	.2	1	.3
Judges	1	.1	0	0	1	.17	2	.2	0	0	0	0	0	0	0	0
Army Officers	3	.5	4	.7	6	1.03	4	.6	0	0	0	0	0	0	0	0
City Officers	9	1.7	1	.2	0	0	2	.3	0	0	0	0	0	0	0	0
Bankers	3	.5	1	.2	3	.5	9	1.3	0	0	0	0	0	0	0	0
Managers	7	1.4	8	1.5	22	3.8	42	6.1	0	0	0	0	0	0	0	0
Total Men and Women in Groups	504		533		583		607		380		374		340		336	

* Table reads: Of the 504 men in the 4th quartile group, 70, or 13.9 per cent, are engaged as professors in a college, or as research workers, etc.

The table reveals that the members of the 4Q[2] group hold the more desirable, important, and responsible positions of the four groups. Of the 4Q group, 26.09 per cent of the men are holding the better positions. Of the 2Q group, 14.5 per cent are holding these better positions. If the position of professor, superintendent of schools, principal of schools, and judge are studied, it is found that the 4Q group and the 3Q

[1]This list of different positions held by the four scholarship groups are given in the writer's unpublished doctor's thesis on file in the library of Indiana University.

[2]4Q stands for the highest fourth in scholarship.

group hold the larger per cent of them. The 2Q group has so many managers of corporations and bankers that it drives the per cent up to 14.5 for that group. The 1Q group has the lowest per cent of these positions. If the four positions of professor or research worker, superintendent of schools, principal of schools, and judge are studied, it is found that the 4Q group has 21.9 per cent of them, the 3Q group has 11.2 per cent of them, the 2Q group has 9.17 per cent of them, and the 1Q group has only 5.3 per cent of such positions. If it may be assumed that the positions named above are the better positions, then it can be said that the higher the scholarship the better the chances are to hold these four kinds of positions. In the case of managers, the situation is different; the lower the scholarship of the group, the larger the per cent of its members who are employed in such positions. High social intelligence is perhaps what is needed here. High scholarship does not make more bankers. Men with low scholarship are more often bankers than graduates with high scholarship; perhaps a banker, like a manager, does not need high general intelligence, but is more in need of high social intelligence. The scholarship group is based on general intelligence and not on social intelligence. The positions as city official, army officer, and judge are not affected much by scholarship. As a rule, the judges and city officials are elected by the people. These positions are held by people with low as well as high scholarship, as they depend more on social leadership or social intelligence. The positions that are more often held by the high scholarship groups are the positions of superintendent of schools, principal of schools, professor in college, and research worker. For these positions a high general intelligence seems to be required.

What is true of men in respect to this is also true of women. A larger number of positions of the better class go to the men than to the women, but the women who do hold these positions are more often in the high scholarship groups than in the low scholarship group.

A Commencement Exercise

C. Arthur Dennis

Principal, Cooper B. Hatch Junior High School, Camden, New Jersey

The exercises described in this article will do much to acquaint the public with the reasons for including shop and homemaking courses in the school curriculum.

THE following describes the commencement exercises held January 30, 1934, in the Hatch Junior High School, Camden, New Jersey. These exercises departed from the traditional commencement and consisted of demonstrations typifying the industrial-arts work and the homemaking courses given in the school. Thirty members of the grading class assisted in the demonstration.

Printing Demonstration

A program in printing, depicting the influence and practicality of the subject, was presented as part of this commencement exercise. The stage was set with a proof press in the center, and behind it were two type cabinets at which boys were working. Four large charts were displayed (two on each side of the cabinets) indicating briefly the work covered in each of the four semesters in printing.

The first student described the invention of printing, by Johann Gutenberg, at the time the middle class of Europe was demanding books. He pointed out that our modern system of education was made possible only through the art of printing which has so faithfully recorded the progress of the past five centuries. It was shown how several of the academic subjects could be practically applied to printing. The possibility of a boy finding his vocational aptitude was also discussed.

The second boy explained the charts exhibited on the stage, showing the work accomplished in each of the four semesters in printing. While explaining the work of the first semester, he displayed a type case at which the pupils work. The first boy assisted (during the explanation of the work of the second semester) in showing how the proof press is used. The slogan, "Printing, the Mother of Education," was printed on the proof press and displayed. Projects made during the third and fourth semesters were then described.

After explaining the material presented on the charts, the boy told of the many forms printed for the school and the board of education by the school printing department. This was described as a means of affecting a substantial saving. The use of the printed forms aid in the efficient handling of the school records. It was pointed out, that although the students were producing things of value, they were not being graduated as journeyment tradesmen, but that they had completed many of the phases of apprenticeship training and were learning to apply themselves to useful industry.

The printshop demonstration

The Woodshop Demonstration

The woodshop's demonstration was decidedly practical. It consisted of work being done, and exhibits of completed work.

Two jig saws, one disk, a spindle sander, a regular shop bench, and a staining table were on the stage. After a short talk by one of the boys telling of the importance of the skilled

craftsmen and handiworkers in the progress of mankind, the machines were started.

The boys at the jig saws demonstrated the cutting out of a magazine holder, while the boys at the sander showed how the parts were sanded. At the workbench two more boys were assembling a magazine holder, and one boy at the staining table was demonstrating how the staining of the project is done.

At the end of a minute and a half, the machines and activity ceased while the speaker explained the work on the jig saws. After another minute and a half of demonstration, the explanation of the work on the two sanding machines was given. All four activities were demonstrated in this way.

Placed along the front of these machines were projects completed by grades. At the completion of the demonstration, the speaker drew the attention of the audience to these projects, telling their purpose and also in what grades they were made.

The woodworking demonstration

Electric-Shop Demonstration

The boys of the electric shop gave a demonstration of their work. This was done with the aid of four panels, each of which was 5 ft. 6 in. long with wiring circuits on them. One of the boys explained the importance of electricity in our daily lives, also the need for a more general knowledge of it, so that full advantage of the comfort and luxury which it brings, may be enjoyed.

The first panel had large drawings of a Western Union splice, also splices showing spaces for solder and proper method of construction to prevent short circuits and to comply with the underwriters' requirements. The second panel had a doorbell mounted, showing the method of wiring and operation from two push buttons. Panel three had a light circuit wired with switch control, while the fourth one had a light circuit with three-way switches.

The wiring on these panels was visible. Each one was demonstrated and then followed by an explanation.

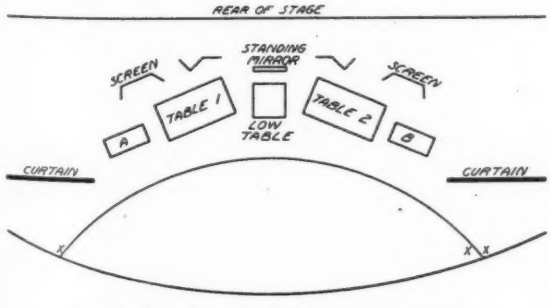
Description of the Clothing-Department Demonstration

As it is impracticable to attempt the construction of any one garment in the fifteen minutes allowed each subject on the program, it was decided to use a scene such as might be witnessed any day in the classroom, followed by the showing of dresses made by ninth-grade girls who were taking part in the demonstration.

The stage set-up, as shown in the accompanying diagram, will give some idea of the arrangement.

As soon as the curtains were opened, the first speaker stepped out, to explain the type of work each pupil was doing.

At sewing machine A, a pupil is shown joining bias pieces of material.



Stage set-up for the clothing demonstration

At table one are shown two pupils pinning a dress pattern to material and cutting it out.

At the low table is a pupil marking a hem on a dress worn by a second pupil.

At table two is a pupil pinning parts of a dress together, preparatory to basting. Another pupil is basting parts of a dress together, preparatory to fitting.

At the sewing machine B is a pupil making a French seam.

From the opening of the curtain until the time for the girls to appear showing their dresses, these pupils are working just as they would in their classes.

When the first speaker had retired, the main speaker advanced to position X. She spoke about clothing, comparing ready-made and individually made clothes, and showed the value of knowing how to sew. She then gave a brief outline of the work covered in junior high school— articles of underwear being displayed as mentioned. Pajamas and smocks, worn by pupils, were presented next, and last, the group of dresses.

For this part of the presentation the girls stood behind the scenes, part on one side of the stage and part on the other. The third speaker then took her position at XX and explained each dress, blouse, and skirt as it was shown. The first five girls appeared singly, alternating one from the left and one from the right, walked to the center of the stage, turned, and took their position at the opposite side. This group included an ensemble, two dresses, one blouse, and one skirt. The remaining girls came forward in groups of two, one from each side. When all of the girls had appeared, there was a semicircle across the entire stage.

The effect of this presentation was greatly aided by the use of the spotlight, both in the actual demonstration and the showing of dresses, and by soft music for the promenade of the models. Before the curtain was drawn, the group divided at the center, passing off either side of the stage.

Dresses worn by all participants were made during regular classroom periods.

Cookery Demonstration

The cooking demonstration resolved itself into two divisions:

1. A résumé of topics stressed in eighth- and ninth-grade courses.

2. A demonstration of one phase of the ninth-year work — table setting for special occasions.

Three senior pupils who had shown unusual interest in cookery were chosen to take part. One, the speaker, told of the work done in the cookery classes, illustrating the talk with foods prepared from menus used in the laboratory work. A luncheon platter, featuring Swiss steak, buttered snap beans, and Harvard beets, was first shown. Then came typical salads,

congealed to enable them to be kept without deterioration; and two desserts, a baked apple and a simple rice custard with meringue. Fancy sandwiches, red and green crystallized grapefruit peel, salted nuts, candy prepared for various faculty teas and cookies served on visitors' day at the school, were next displayed and discussed. There also were other illustrations of food which had been prepared for particular occasions.

Then there was a table-setting demonstration, at which the speaker explained in detail the setting of the table for an informal meal while two waitresses did the actual work. The menu used was for a Sunday night supper and was prepared in the class. The Sunday night meal was chosen for its newness, for fashions change in meals as in clothing. A red and white color scheme was carried out because it is an unusual coloring plan for winter meals and because of the nearness of the demonstration to the month of February.

Visitors were invited to inspect the table after the exercises were over and many availed themselves of the opportunity.

Vitalizing Home Mechanics

J. Edward Bond

Junior High School, Port Chester, New York

A method of obtaining, not only live jobs for the student of home mechanics, but also enlisting the parents' interest in what their boys are doing in the school shop.

HOME mechanics, by its very nature, is interesting to the student. At times, however, the instructor will find it difficult to keep some of his boys busy.

Among the aims an instructor lays out for himself at the start of the school year, "To develop pride in undertaking," should be emphasized more than any other. If a boy takes pride in his work, he will be more likely to accomplish the other aims set up by his instructor.

In home mechanics there are, of course, jobs, the concrete result of which cannot be shown except in class rating. There is, however, a way to know the result of even the smallest job in the course. For four years this method has been employed in the writer's classes with a percentage success of 84.4.

The accompanying form describes itself. The success of the whole enterprise, of course, depends upon the instructor's follow-up. The form letter is distributed to the boys of each class and a date set when all returns must have been made.

PORT CHESTER PUBLIC SCHOOLS
Port Chester, N. Y.
Department of Industrial Arts

Mr.————:

In this department of the Port Chester schools an effort is made to interest your boy in what is called Home Mechanics.

This name is given to that group of items which represent repairs to your home and includes such things as broken sash cords, leaky faucets, loose hinges, broken furniture, and in fact anything which needs the attention of a handy man. Below is a detachable list of these items.

That this department may give your boy the practical experience he needs in this work, will you kindly place a check before the jobs which need attention in your home, and return the list to us in order that we may give your boy the necessary instruction concerning the work you have checked?

We are confident that the boy will go at his work with renewed vigor due to the fact that he will be showing you that his course in manual training is of real value to him.

Just tear off the list on the dotted line, check the items and return the slip to the High School, and your son will do the rest.

Sincerely yours,

————————
Instructor

Tear here

Name_____ Address_____ Grade_____

Check	Job	Check	Job	Check	Job
	Cooking Utensils _____		Furniture Describe repair needed _____ _____		Porch Steps _____ _____
	Doors Hinges Lock broken New key Stick _____		Lawn Mowers Adjusting Repairing Sharpening _____		Windows Fastener Loose Need paint New glass Old glass loose Sash cord Sash weight Tight _____
	Electricity Doorbell Electric cords Lamp switch Radio Thermostat _____		New Cabinets, Shelves, etc. _____ _____		Other Items _____ _____ _____ _____
	Faucets Chatter Leak Too tight _____		Painting _____		
			Phonograph _____ _____		

Date inspected_____ Quality of work_____
Remarks

Inspector_____

When the form is returned to the shop, either by the pupil or by mail, it usually shows from six to ten jobs checked off, all affording the boy an opportunity to show how well he can follow directions when working on a project at home. The forms returned by the parents are returned to the pupils, and the class, aided by the instructor, checks up the jobs in their order to find how many forms call for the same jobs.

Suppose, for example, that ten boys have checks before jobs which are listed under windows. The instructor gives these boys a demonstration of the method employed in accomplishing each job. Detailed information sheets are then issued to the boys, in order that assurance is made doubly sure that there will be no slip-up on the job. It has been found advisable for two boys who perhaps live near to each other, to work out a partnership affair, each one helping the other. It will be found that this method provides a sure check on the correlation of the effect of the teacher's demonstration and the information sheet.

It will be clearly seen that there is a large field for experiment and that there are unlimited possibilities for advancing the boy along the line of thinking for himself in this method of approach. Gradually the boys who have experienced certain of the jobs may be made instructors, and marked upon their presentation of the problem.

The marking of the student after he has completed his home project may be done by either the parent or by the teacher who, if he can possibly spare the time, should personally inspect the job, so that he can contact the parents. This home visit gives the teacher an opportunity of pointing out other jobs which may contribute to the welfare of the home, of the pupil, and of the community.

It may be wise to make these inspections of home-mechanics projects in the homes but once or twice a year at the most. It is well, also, to let the student know just when the instructor will visit, in order that there will be no unexpectedness in the arrival. It has been found that this arrangement makes the meeting between parent and teacher more satisfactory than a surprise arrival.

Permanent record cards of work covered are helpful. They provide a check on the progress chart, and also provide an excellent method of showing to the parent just what the child is doing in his shopwork. This is accomplished in either of two ways: first, by adding a copy of the permanent record card into the report-card envelope each time the report card is marked and taken home; or, by taking the cards along when making the home visit. The first has been found to be more satisfactory.

Forge-Shop Exhaust System

L. D. Keaton

East Texas State Teachers College, Commerce, Texas

A good sheet-metal job for the students of any metal shop. This project afforded the students some good experience and a wealth of practical and usable knowledge.

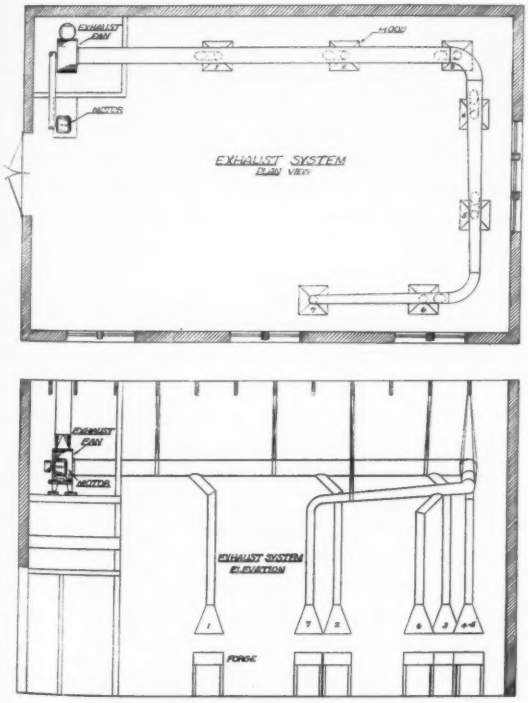
FOR a class project in sheet-metal work, the class of the spring term of 1932 was given the construction and the installation of an overhead exhaust system for the forge shop at the college.

One of the first things to learn was that the requirements for this type of work are not standard, and that each shop or project presents problems peculiar to itself. Of course, there are certain principles of exhaust and blower piping that must be carefully observed.

The forges are placed 30 in. from the wall around three adjacent walls of the shop. The exhaust fan was located in line with the forges, on a platform especially built for it and the motor.

Measurements were then taken and placed on sketches showing the location of the exhauster, the motor, the main pipe, and the branch pipes leading to the different forges. From these sketches calculations were made to determine the sizes of the hoods, the sizes of the branch-line pipes, and also the taper of the main-line pipe.

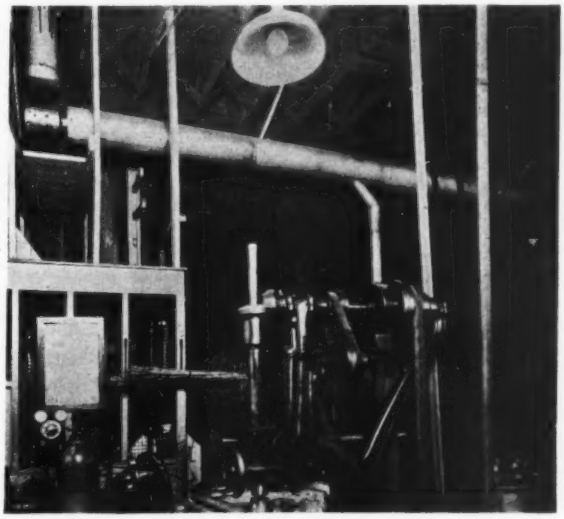
Then the work was organized on a productive basis and the members of the class were assigned specific jobs. Patterns were drafted for all elbows, transitions, and intersections.



The shop layout

The hoods, in the form of a frustum of a right pyramid 22 in. square at the base, 6 in. square at the top and 22 in. high, constituted the first unit of construction. The patterns for the hoods were laid out directly on the metal and cut out. Transitions, 6 in. square at the hoods and 5 in. round at the top and 8 in. high, were constructed and riveted to the tops of the hoods. Ears were riveted to the sides of these transitions so that the hoods could be wired to similar ears on the first joint of each branch pipe leading from the forges.

The outlet pipe, 12 in. in diameter, together with roof flange and cap, were made next and installed. The exhauster has a 9½-in. square outlet and an intake diameter of 12 in.



The exhaust system installed

The main pipe was made up in three sections, 30, 18, and 12 ft. long, respectively. All joints were riveted and then soldered. The main pipe is 12 in. in diameter at the exhauster and tapers to 5 in. in diameter at the last forge which is 60 ft. from the exhauster. The first section of the main pipe has three intersections, and the second and third sections have two intersections each, making a total of seven. All the pipes leading to the forges are 5 in. in diameter, the sizes being determined by calculations of cross-sectional areas. Near the main in each of these 5-in. pipes is a 5-in. 135-deg. elbow, thereby allowing these pipes to intersect the main at an angle of 45 deg. To pass the main drive shaft of the machine shop, there is a drop of 20 in. in the main pipe from the first 90-deg. elbow to the last forge. The main pipe was placed around the three adjacent walls of the shop to avoid conflict with the belts of the other machines installed there.

All pipes were constructed of No. 20 galvanized sheet metal. The system operates through an exhaust fan 26 in. in diameter and is driven by a 3-h.p. motor running at 1200 r.p.m. The hoods are 18 to 24 in. from the fire in the forges. The total cost of the project to the school was about $100.

EVENING-SCHOOL OFFERINGS

The type of instruction offered in an evening school should depend on the special needs of the people. Find out the things the people want to know, and then teach it to them. — *Lewis Gustafson.*

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

The Other Fellow's Shop

The Bible refers to the common human fault of looking upon our own shortcomings as little things, while the same fault in others becomes a serious offense. The same book gives us the Golden Rule which admonishes us to treat our neighbors as we wish them to treat us. These admonitions are so frequently forgotten, probably because their application, although they ought to affect every human action, are not consciously made part of the everyday motivating factors in our lives. Just to mention one case, consider how shop teachers frequently forget to apply the Golden Rule in their visits to the other fellow's shop.

In the back of every shop teacher's mind is a picture of an ideal shop immaculately clean, with all appointments well ordered; the tools housed in drawers, wall cases, or toolrooms, whichever meets the greatest favor in the individual teacher's mind; the equipment gleaming with the brilliancy common to all newly installed things; ceilings and walls of the proper color for perfect reflection of illumination; material and equipment racks with properly labeled compartments and with everything neatly stacked; windows spotlessly clean; shades arranged at just the right height; gleaming benches which do not show a mark or an indentation on their mirrorlike surface; and every student in this imaginary Paradisaical school shop, feverishly engaged upon his particular task with an all-absorbing interest.

It is a picture of this perfect shop which the average visiting teacher draws forth as a means of comparison when he visits the "other fellow's shop." Over in the corner a boy awaiting just such an opportunity as that caused by the entrance of a visitor to distract his teacher's attention, stuffs a caramel into his mouth. Three other lads find the interruption opportune for a consultation on the arrangements for a pleasure excursion to be undertaken that very night. Immediately the visitor concludes "lax discipline."

The bench tops show some bad scratches and indentations and some of the equipment looks decidedly old. "Doesn't take care of his equipment," is the critic's next mental connotation.

The materials racks have just been culled over by some boys looking for some special materials. They, therefore, have the appearance of being very much disordered. The windowpanes are not quite so bright as they were the day after they were washed two weeks ago. Several partly finished projects, too large to be placed in the cabinets provided for that purpose, have been piled one on top of the other in a convenient corner of the room. The visitor, therefore, mentally classes the teacher in charge of the shop as being a poor housekeeper.

Frequently that is the net result derived by many shop teachers from a visit to the other fellow's shop. The common shortcomings which they discovered loom so large that they completely overshadow the many good points that might have been disclosed by one inclined to look for them. The faults discovered have seemingly blotted out any possible merit. The fact that the visiting teacher, had he used the same criterion for judging his own shop, would most likely find similar or worse defects, does not enter into the picture. He simply classes the shop visited as below par, dubs the teacher to whom the shop belongs as "not so hot," and looks upon the time spent in making the visit as wasted.

An application of the Golden Rule might have altered all this, and probably have turned the worthless trip just described into one not only worth while but enjoyable at the same time.

The Annual Exhibit

At this time of the year, many teachers are preparing for the annual exhibit. It may be well to again call the attention of such teachers to the articles on exhibits that have appeared within the past few months, especially those written by Mr. Alfred G. Pelikan and by Mr. Frederick James Moffitt on pages 113 and 116, respectively, in the March issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION.

Members of the Western Arts Association who were fortunate enough to attend the convention at Detroit, had an excellent opportunity to see at a large department store, a very well arranged exhibit of the work done in Detroit school shops.

In any exhibit it is well to remember that impressiveness is gained by simplicity rather than by complexity, that a few good articles well displayed are worth a large number of articles arranged heterogeneously. If the exhibit can be arranged so that students are shown actually engaged at work, an added factor of interest can be given which should not be overlooked. The human touch thus produced will more than outweigh the extra trouble and supervision which this kind of exhibit requires.

It should not be forgotten either that projects, and even students at work, will not inform the onlooker as to the nature and purpose of the work done in our school shops. There are still too many laymen who will look upon the high-school youngster working at a press as a boy learning the printing trade. Likewise the student busily engaged at turning a small motor shaft on an engine lathe, in the minds of most onlookers immediately becomes a machinist. To obviate the forming of these erroneous conceptions, it is well to display prominently, charts upon which the objectives of

the course are given in terms that are easily understood. The engineer, the chemist, and the scientist have learned long ago that in order to arouse public interest in inventions and new discoveries, newspaper and magazine descriptions, lavishly illustrated and explained in popular terms, are the best means for arousing favorable public opinion. The school teacher should learn from these publicity methods, that all explanations should be given in nontechnical terms. Do not speak of the objectives of the course, but rather tell the public now just why shopwork in general should be given in the school and what the school hopes to achieve thereby.

If finished projects are displayed, they should be well displayed — near enough so that the onlooker can see the smallest details, yet far enough away so that the work cannot be improperly handled. If the project is labeled, care must be taken that the label is plainly legible from the position which the onlooker must naturally take. The label also should contain all of the pertinent facts. The information that this or that project was made by Johnny Doe, 13 years of age, in the seventh grade, does not convey much information to the one who is viewing the finished work.

It is better to state how long Johnny Doe has been pursuing the work of which the exhibited project is a part. It also should be remembered that it is better to state how long this time is in class hours, rather than in semesters, or years, or grades. To the layman, second-year woodworking means nothing, but if he is told that a certain project was finished by a boy who had spent 40 hours in a certain school shop, most onlookers, especially those who have worked with the materials represented by the project, will have some means of judging whether the boy has really achieved something.

Most school-shop exhibits in the past have failed to take one or more of the points just mentioned into consideration. These omissions have done much in having the public form wrong conclusions about the value of the work taught in our school shops.

Making Out Requisitions

The time for closing the school shop for the year 1933–34 is approaching. It is necessary, therefore, to look forward to the opening of school next fall. This brings to mind the question of requisitions. The burden of the troublesome task of making out requisitions is not to be lightly approached, nor can it be easily handled. Far-off forecasting is often difficult, and under present conditions it is doubly hard because it almost takes a prophet to say what is going to happen next year. Nevertheless, the job is there and must be attended to.

One of the best methods for deciding what to requisition for the coming school year is to make an analysis of the requirements. Probably the first thing that has to be definitely understood by the one who makes out the requisitions are the objectives of the educational work for which the requisitions are to be written. The age of the student, the type of work — whether it is of the industrial-arts or vocational type — the class size, type and size of selected projects, intensity of use of the items requisitioned — are they to be used by only a few students, or are they in continual use by many students? All of these factors must be carefully taken into account in making out this analysis.

If other equipment and materials lists are available, they should be used to check against in order that every necessity be thought of and planned for. Such check lists as those which appear in *Bruce's School Shop Annual* or which may be obtained in some instances from city and state supervisors, should therefore not be overlooked. It is true, they may not represent the last word as lists go, but they do form a basis from which to start. The equipment and materials lists in *Bruce's School Shop Annual,* for instance, were not written to satisfy any particular case. They contain items, however, from which the individual can practically satisfy any condition which he may want to set up. In other words, no matter what list you may use in checking against your needs, be sure that you use good judgment and discernment in order to satisfy your own requirements.

Under present conditions, economy is imperative, and the problem of requisitioning is made still more troublesome by the necessity of determining how far to go in the matter of substituting second and third choices for the things which experience has demonstrated as being the items which might be accorded a first-choice rating.

After having set up the list, the next thing is to get as much information about the various items as possible. For this purpose, again, glance through the advertisements which appeared in the back copies of this magazine. It may be truthfully said that our advertisers represent the best sources from which to obtain the things that the school shop needs. They are the true and tried purveyors of school-shop goods. They have demonstrated by past services, that they are not merely interested in selling goods, but also in furnishing materials which are of first-grade quality. They know what the school field needs and they have produced not infrequently specially designed equipment for the school shop. It is in times such as these that real economy demands the purchase of goods from reputable firms who have demonstrated their willingness and ability to service the equipment furnished.

The making out of requisitions as already has been stated, is a difficult but necessary job. If approached in the systematic manner which has been outlined in the foregoing, the problem will lose much of its formidableness and the task that in the past may have been dreaded, will become one that, if not really enjoyable, at least will be bearable.

Guidance Through Hobbies

Max Chambers

Public Schools, Federalsburg, Maryland

In this second of a series of articles on hobbies, the value of guidance through avocational interests is discussed.

IN times gone by, many plans expressing ideals concerning vocational guidance have been advanced, but regardless of what course in high school or college a student may pursue the ultimate goal is a job, self-sustenance, independence.

The aim of all teachers should be to offer every opportunity and encouragement to every pupil, for it seems that the day of drones is passing. The Federal Government in its relief and rehabilitation administration is, it seems, planning to offer equal opportunity for survival to all. The simple law will be, "Make good or make room." As yet we do not know what "make room" will mean, but in all probability the habitually unemployed will be placed in suitable and advantageous concentration camps and thereby taken out of useless circulation.

Courses in classical or professional education are necessary and vital, but will in the coming years, no doubt, decrease in favor of vocational education. As the educational program of the country now stands, more than 90 per cent of all students are taking academic-type courses while the remaining 10 per cent are vocational-course students. Industrial conditions are actually just the opposite — 90 per cent of the earners are workers and only 10 per cent are professional people. This means that somewhere there must be a compromise. The new type of education possibly will be a finer combination of the academic and vocational courses offered on a basis so attractive that the interest lag will be at a minimum. Many of our present-day students drop out of school because they are not interested in the subjects offered. The subjects and the teachers are not animated enough to hold them, but in the face of reduced child labor they cannot be released to roam idly. They must be directed and guided into some satisfying activity, if not a vocation then an avocation with the hope that the hobby will lead to some definite life interest.

The most serious part of our success in this new era is building up an appreciation of the value of spare time. Even if everyone has a job, each must also have a healthy wish-formation complex. They must wish to enter some elevating, satisfying, and growing hobby. The *hobby fair* is a means toward this end and many a youngster is finding his life's work in his hobby. Thousands of men are already working at their hobbies but the main aim should not be the avocation but rather the vocation.

The hobby plan is the best and surest method of promoting guidance toward a vocation. The next best plan is actual experience on the job. Webb Waldron, in the *American Magazine* for November, 1932, gives a very interesting view of this plan, but it seems a bit far-fetched when we think of the 20,000 or more jobs and several hundred or several thousand pupils in each of the various schools of the country. However, progress is being made on all plans and should be encouraged by everyone interested in the boys of today and the America of 1950.

Wood Carving—V

J. I. Sowers

Director of Industrial Arts, Miami, Florida

The fifth in a series of articles describing the art of wood carving as adapted to industrial-arts students.

IN INTRODUCING the style and type of carving we shall take up in this article, it may be well to mention briefly, by way of review, the kinds of carving taken up in the four previous articles. These were: simple incising, incising with threaded background, chasing, spiral cutting, pierced-work carving, and level-surface carving in low relief.

Those who have followed these articles up to this point, and had time and opportunity to work out some form of exercise, or project, under the various types given, have, I am sure, made one important discovery, and that is that to do passable work in carving, and to get pleasing results in this art is not nearly so difficult as you at first supposed. Indeed it is a constant matter of surprise how readily boys acquire this ability, and carve pieces of apparently difficult design with a fair degree of excellence.

Of course, wood carving as we conceive it is not an end in itself, but only a decorative effect of some form of construction designed for use. It may seem useless to say this, but after having seen many pieces of amateur carving that could serve no useful purpose, it seems necessary to point out that what we are attempting to do in these articles is to *decorate construction*, not *construct decoration*.

Carving Modeled in Relief

While this form of carving is more difficult than any of the kinds of carving previously taken up, it is also more interesting and possesses greater artistic possibilities.

Figure 21 is an introductory design for practice in this type of work. A much simpler design may be taken; indeed the student may work on an exercise of any one single part of this design, as, for instance, the development of a single leaf. This exercise is not too difficult for one who has done some of the work previously studied, and when done, the student will have accomplished a piece of work of great adaptability in future decoration.

It is a good idea to work this design out about 6 inches square as an exercise. Later in actual practice

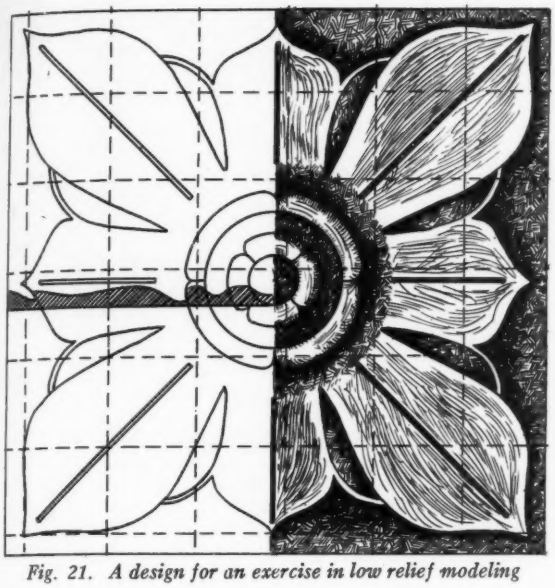


Fig. 21. A design for an exercise in low relief modeling

this design, and modifications of it, may be used to fit spaces of widely varying size and shape. For this first work select a piece of wood of fairly even grain, about 8 inches square. The squares shown on the design in Figure 21 are 1 inch. Lay these out and reproduce the drawing, then with carbon paper trace the design on the wood. The next step is to shade in the background and the modeled effects in the drawing with a soft drawing pencil. One half of the design in Figure 21 is shown shaded this way. This serves to give the student the idea of the shape and depth of his work in its third dimension. Every wood carver soon learns that he must acquire the ability to draw quickly on the wood with firm, broad strokes of the pencil. Ability to draw is, of course, closely related to ability to do *good* wood carving. The more difficult the piece of work to be undertaken, and the more demands it makes upon the student's ability to visualize, the more necessary it is to develop it first carefully in pencil, or better yet, to first work it up in a clay model before undertaking to carve. Just as the sculptor in stone first works up his model in clay, so the beginning carver, or the experienced workman, when undertaking a new and difficult piece of work, finds it helpful to model it first in a plastic material. The clay model of this exercise is shown in Figure 22. As is shown here, it is often unnecessary to finish the whole of the model in clay. Since one half of this exercise is a duplicate of the other, only half of it is worked out in clay. All of the graphic arts are related; ability in one has much carry-over value in others. The practice of modeling a part of a new design in plastic clay before undertaking it in wood is very helpful to the student. Figure 22 also shows the wood carving completed. This piece of work was made by a 9-A boy in one of our junior high schools.

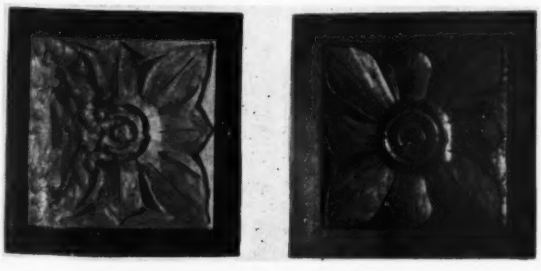


Fig. 22. Design modeled in plastic clay, and the finished piece

After having traced the pattern of the design on the wood, and shaded it in as suggested, the next step is to outline the contour. This operation is shown in Figure 23. This outline should be completed before any other cutting is done. If possible, a gouge with a *sweep*, or curve, that will fit the arc of the design should be selected. If this is not possible, a small carver's chisel may be used, cutting only a small part of the arc at a time. The tool is placed on the outer edge of the line and tilted so as to cut away from the pattern. If this edge is cut straight up and down, or slightly undercut,

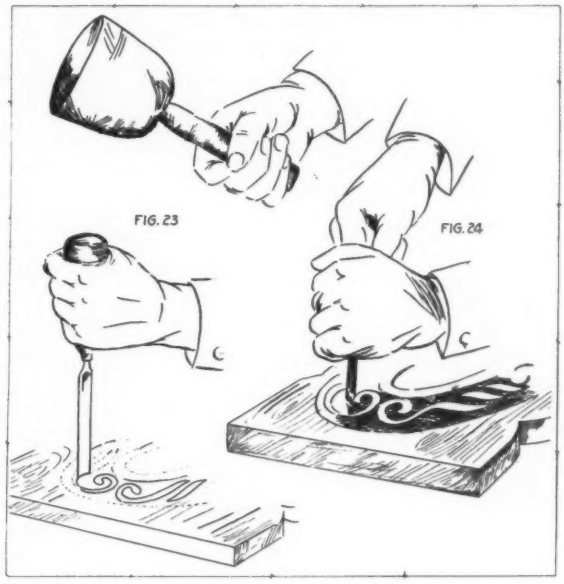


Fig. 23. Cutting the outline of a design
Fig. 24. Paring away a background

it is likely to chip. In this outlining operation it is well to cut those lines running *across* the grain first, otherwise there is danger of splitting. The depth to which this outlining should be done is determined by the amount of relief desired. In general, the student should do his first work in low relief, though his own unrestrained tendency is often to do the opposite.

Having outlined the contour of the design, the next step is to take a gouge with a very flat sweep and very carefully begin paring away the background. Better results will be accomplished by taking the ground down a little at a time, all over the whole piece, rather than finishing it first in one place. The student need not attempt to work down the background perfectly

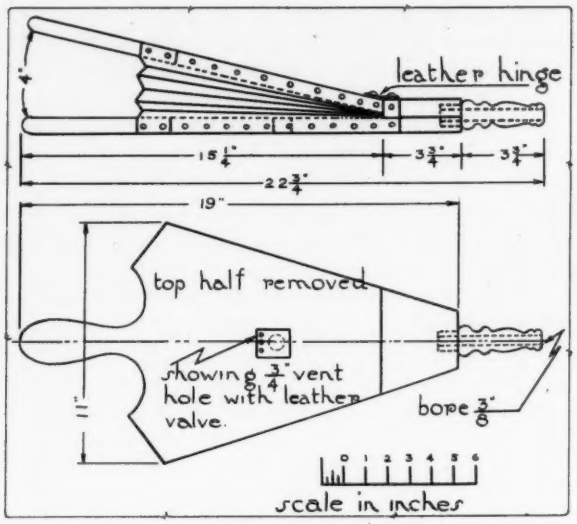


Fig. 25. Construction details of bellows

Fig. 27. Finished bellows

smooth, or finish it by sanding. However, a few indications of tool marks in the ground adds to the effectiveness of the work. The marks of the gouge will be noted quite clearly in the ground of the finished work in Figure 22.

The next thing is to begin working out the design. A gouge with a very flat arc is used for the leaves, and gouges with a much *quicker* sweep for the small work in the center. It will be observed that the same method is used here as in cutting down the background, the same rule holds good in both instances: waste the wood away slowly. Having made the model in clay for this first exercise, the careful worker will have little difficulty in working out the design in wood.

Here again the object should be to finish the work with the tools with little resort to sanding, scraping, or rasping.

Now, in this piece we have some *in-lines*. By this is meant lives wholly within the design, as these resemble the veins on the deaf, or the scales on a fish, hair on an animal, etc. These are made with the No. 8 gouge shown in Figure 15, article III, on page 121 in the March number of this magazine.

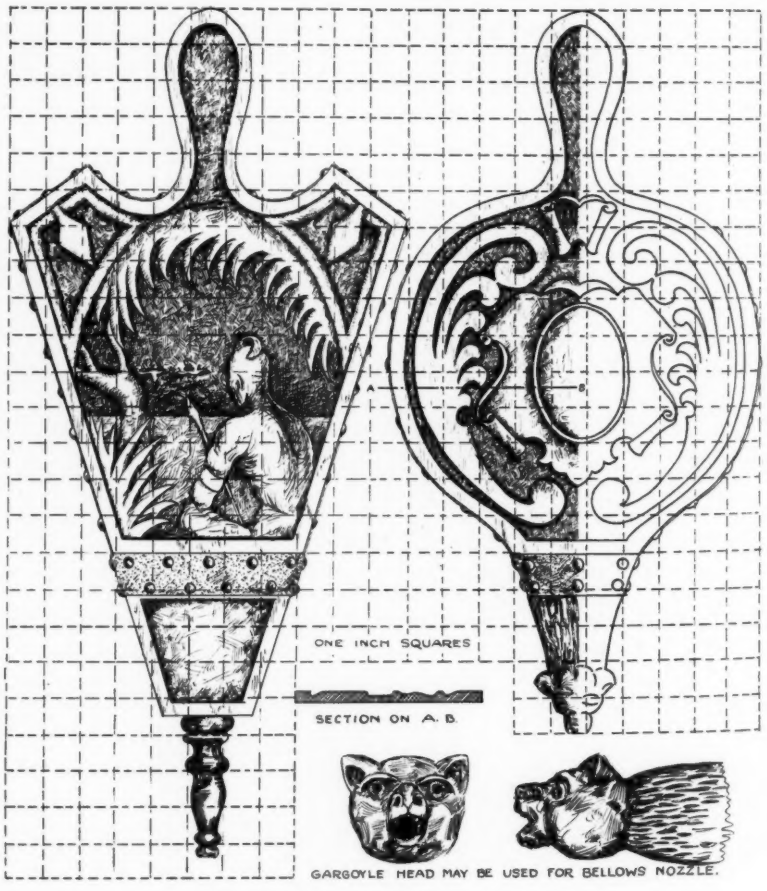


Fig. 26. Showing some shapes and designs for bellows

In carving, the student must learn to work his wood in the easiest way, and to the best advantage. He must discover which way it cuts best, and not cut in a way to tear up the grain. The beginner should learn to cut in clean, firm strokes, and not depend on wiggling his tool through the wood. The hand nearest the work is the *control hand*, the other hand furnishes the power

for the forward stroke. The control hand both resists and guides the forward movement, so that in carving there is little opportunity for a tool slipping. If this were not true, the work of weeks might be spoiled by one awkward stroke. Later on in his work the ability to cut a *sweep stroke,* should be acquired. This cut will be explained in the next article.

Those who have been following this series of articles have learned to expect that some piece of work will be given for actual work in each number. For the project in this first work in relief modeled carving we are giving a colonial-type fireplace bellows. A working drawing of this bellows is shown in Figure 25, this together with the sketches of the shapes and designs given in Figure 26 give sufficient information for working out this model.

Our own senior-high-school boys have made many of these bellows in a wide variety of carving designs. The scroll design given in Figure 26 is the easier of the two shown. The gargoyle head presents a bit of full-figure carving, but is not difficult if first worked out in plastic clay. After a few are made, this practice of working them up in clay will not be necessary. The bellows makes an excellent project for carving, and is an object of considerable artistic merit.

Two of the finished bellows are shown in Figure 27. These are the work of two of our senior-high-school students.

In this article we have advised that the student's first work should be in low relief. This does not require so much *in-carving* as high relief, yet if the design is well chosen, many valuable pieces of work may be produced. As an illustration, note Figure 28, which is a *vargueno,* a fifteenth-century Spanish writing desk, made by one of our senior-high-school boys last year. It is done in very low relief, but is an excellent design and a pleasing result is obtained.

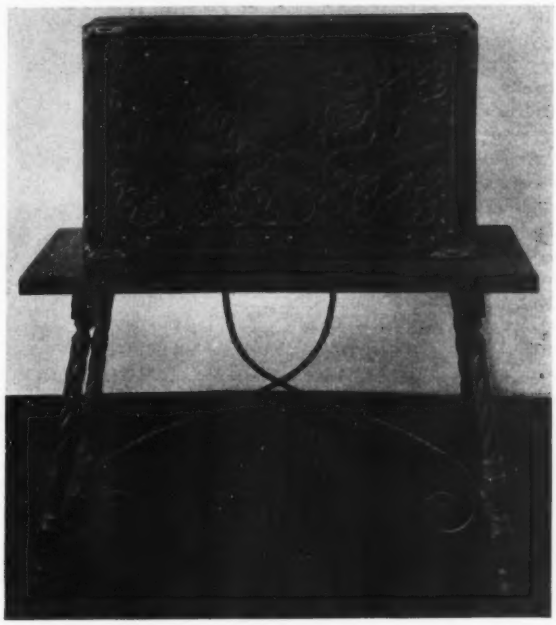


Fig. 28. Low relief modeled carving on a Spanish vargueno

Printshop Terms

This list of printshop terms will be found helpful by the teacher of printing, but it also is useful to the teacher of English in junior, senior, and technical high schools, or in part-time and full-time vocational schools.

accent
accessory
acetic acid
acid proof
a.c. motor
adapted
ad copy
advertisement
agate
albumen
alignment
alternate
ampersand
announcement
antimony
antique type
antique book paper
antonym
apostrophe
appropriate
appropriateness
artistic
ascender
assembling elevator
attractive
automatic
automatic feed
automatic feeder
backbone
balance
bank
bearer
bed
bellows
Ben Day screen
benzine
bevel
beveled
bichromate of ammonia
billhead
bind
binder board
bindery table machines
Bismarck brown
bite
black
bleed
blind embossing
blotter
blue
bodkin
body
body matter
body type
boldface
bond
bond paper
bone folder
booklet
book paper
book plate
border
bourgeois
bracket
brass
brass rule
brayer
brevier
bronze
bronzing
brown
buff
burnisher
burnishing
business card
calcium bisulphate
California job case
capitalization
caps
caption
cardboard
caret
case
casein glue
Caslon
caster
casting
cast type
Caxton
cellulose
cement brush
center
centered
center head
Century
certificate
character
chase
chase rack
chaser method
chemical
chloride of lime
chocolate brown
chrome yellow
chromium plate
clamp
classification
clay
cleaning
clean proof
coated
coated boards
coated stock
coating
cold
collating
collodion
colon
color
color combinations
color form
coloring
column
comma
commercial
comparative
comparing
complementary colors
composing rule
composing stick
composition
compounding
computation
condensed
condensed letter
consistency
contents
contrast
copper

copy
copyholder
copy reader
corner
correcting
correcting proof
correspondence
counter
counting
counting machine
cover design
covering
cover paper
cream
cut
cuts
cutter knife
cutting
cylinder press
dandy roll
dash
d.c. motor
dead
deckle edge
decoration
decorative
defective
delete
demy
depth
derivatives
descender
design
developing
De Vinne
diacritical marks
diagonally
die
dieresis
digester
dirty case
dirty proof
discord
disk ruling machine
display
distributing
distribution
division
dot-line leader
double
double page
double slug
dove
drab
dragon's blood
drawsheet
drier
drum cylinder press
drying rack
dummy
duplicate
editing
editor
effective
electros
electrotype
electrotyping
elementary
elements
em
embossed
embossing
embossing compound
embossing die
emphasis
em quad
en
enameled
endurance
English finish
engraving
en quad
envelop
etched
excessive
exclamation mark
expanded
expanded letter
extended
extra condensed
face
families
family
feedboard
feed edge
feeding
feeling
fibers
figuring
final reading
five-to-em space
flat bed
flesh
flush
flyleaf
folding machine
folio
font
foot
footnote
form
formal
form trucks
foundry proof
foundry type
Fourdrinier
four-to-em space
frisket
furniture
furniture-within-furniture method
galley
galley proof
gangs
gasoline
gathering
gauge pins
gloss finish
glue pot
golden oblong
Golding jobber
Gothic
graduated
graphite
gray
green
gripper fingers
grippers
groove
grouped
Gutenberg
hair-line register
halftone
handbill
handling
hand paper cutter
hand-tooled
hanging indention
harmony
heading
hell box
heteronym
holdover
homonym
horizontal
hyphen
hyphen leaders
illuminated
illusion
illustrated
illustrations
imperfect
imperial
imposing-stone
imposing-table
imposition
impression
imprint
inappropriate
indent
index bristol
informal
ingredients
initial
ink
ink disk
inking
ink knife
ink mill
insert
inspected
intaglio
interlay
interrogation mark
intertype
inverted
invoices
isolating
italic
job black
job case
job type
jogged
justification
justify
justifying scale
kern
kerned
kerning
kerosene
keyboard
kill
label
labor-saving font
ladle
laid
lay of the case
layout
lead
lead cutter
leaded matter
leader lines
leaders
leading
ledger
lemon
letterheads
letter press
letter spacing
lift
ligature
light face
lilac
line
line casting
line etching
line gauge
linen
line register
linotype
lithography
live matter
lock-up
logotype
long four
long primer
lower case
lower news case
lye
machine finish
magazine
make-ready
make-up
mallet
manufacture
margin
marginal
maroon
matching
materials
matrices
matrix
mat surface
measurement
mechanical
medium
menu
metal furnace
metal furniture
mill bristol
minion
miterer
mitering machine
mixing
modern
modernistic
mold
monotonous
monotype
mortised
mortised design
mortiser
motto card
movable
multiple
multiple forms
multiple stitcher
neck
negative
neutralizer
newsprint
nick
nickel-steel electrotypes
nomenclature
nondistribution system
nonpareil
odd size
offset
offset papers
offset printing
oiling
oil gold
old style
olive
onion skin
opaque
operator
optical center
orange
original
originality
ornaments
overdisplay
overhang
overlap
overlapping
overlay
overlay knife
packed
packing
padding
page form
page proof
paper
paper beater
paper cutter
paper fastener
paragraph
parallel
parentheses
parenthesis
patented base
path line
pearl
perfecting cylinder press
perforating
perforating rule
perforator
period
photo-engraving
photogravure
photolithography
pi
pica
picking
pigment
pink
pin mark
planing
plate
plate holder
platen
platen press
poetry
point
point body
point line
point set
point system
poster
powdered
power paper cutter
press
pressboard
press locks
press proof
presswork
primary
process
process printing
production
program
prominence
proof
proofed
proofing
proof marks
proof planer
proof press
proofreader
proofreading
properties
proportion
pulp
pumice
punch
punctuation
purple
pyramid
quad
quadruple machine
quarto
quoin
quoin key
quotation mark
rag paper
ratio
ream
recasting
red
reducer
reference
reference mark
register
register forms
reglet
relationship
remedies
remedy
removing
revise
revising
revolution
revolving
rigid bed
ripple
rollers
roller trucks
rose
rosin
rotary press
rotogravure
round-corner cutter
routed out
router
routing
royal
rubber cement

rule
rule cutter
ruled
ruling machine
runs
saddle-stitched
salmon
samples
sans serif
sawtrimmer
scorer
scoring
screen
script
seal
secondary
sectional blocks
selection
semicolon
sensitive
series
serif
set
shade
shape
sheetwise
shell
shipping
shooting stick
shoulder
shute board
side-stitched
signature
signature presses
silver nitrate
simplicity
single
size
skeleton chase
skeletonizing
sketch
skids
skimmer
sliding platen
slip-sheet
slitter
slitting attachment
slug
slug cutter
smudge
snuff
snugly
solid matter
sorts
space
spaceband
space mark
spacing
spatula
special finish
specification
specimens
spectrum
splicing
spring-tongue gauge pin
spruce wood
square eight
square four
standard
standardization
staple binder
statement
static
stationery
stereotype
stereotyped
stet
stitcher
stock
stock table
stoneman
stone proof
stop cylinder press
stopped out
storage
straight matter
straw
striker
stripped
style
subhead
sulphite soda pulp
supercalendered
swash letter
symmetry
synonym
tabbing pot
table
tablet knife
tabular
tack
tag board
tags
technical
text mark
thermography
throw-off
ticket
tin
tints
tissue paper
tissues
title-page
tone
tooling
tools
top bale
transparent
trimmed
triple
troubles
tweezers
twin spaces
two-on
two-revolution press
tying
tympan
type
type faces
type high
type-high gauge
type-high planer
type planer
typesetting
typewriter paper
typograph
typography
typographic
uncoated
underlay
underscoring
universal blocks
upper case
varnish
vermilion
vertical
vignette
violet
worm
warping
washing
waste
water-color inks
watermark
wax
weight
white
wood block
wood cut
wood pulp
wood type
work-and-turn
work-and-twist
wove
writing paper
wrong font
Yankee case
yellow
zinc etching

A Lesson in Enameling[1]

Gertrude S. Twichell

Fitchburg, Massachusetts

A simple and concise article on the enameling of jewelry and metal work with full description of the method of doing the work and of the equipment that is needed.

THERE seems to be an increasing interest in enameling, and many instructors are introducing it into their classes in metal work or jewelry. Where school time is limited, only the simplest problems should be attempted, and the instructor should be thoroughly familiar with every detail of the work in order to prevent too many failures and consequent discouragement. Where one is working with chemicals and heat, as in enameling, utmost care must be used, for hours of work may be spoiled by one instant of carelessness. Patience, care, and genuine love of the work, however, will produce some very beautiful results even in comparatively simple problems.

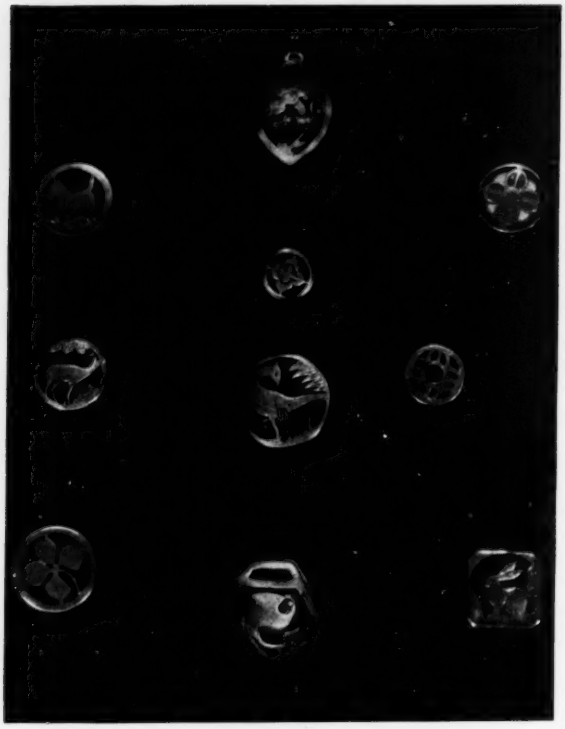
It is assumed that the worker already knows how to saw accurately and to solder correctly. Careless sawing and improper soldering are never justified, and only the careful worker should attempt enameling.

On jewelry or metal work, either transparent or opaque enamel may be used — the matter being one of suitability to project and effect desired. Familiarity and experience alone will give freedom in the use of colors. It is best for the beginner to make color tests on both copper and silver first. A piece of copper 1½ by 4 in. can show a dozen or more colors, while small scrap pieces of silver may be used for one or two colors. Be sure to scratch the number of each color deeply on the metal next to it, otherwise the sample may be entirely useless. It is almost impossible to identify unmarked colors, as there are perhaps 33 purples and lavenders, and almost 40 greens given in one catalog list! Metal for these tests should be cleaned just as thoroughly as though for some finished problem.

After finishing the tests, the first problem chosen, we will say, is an enameled silver brooch. The design may be etched, engraved, or chased. Whatever process is used, channels must be made in which enamel can be laid. We will describe a slightly more difficult method, because the same directions may then be easily adapted for simpler processes. First make a saw-pierced design on a piece of silver of about 22 gauge. This will be mounted on another piece later, thus forming the necessary channels for the enamel. Be sure that the sawing is done accurately and that the outer edge is carefully filed. If the brooch is circular, use steel dividers to mark the edge, and true to this line. Bevel the edge slightly and polish with tripoli. Anneal, cool, and clean in a pickle made by adding 1 part sulphuric acid to 15 or 20 parts water. Leave the brooch in the pickle from 5 to 15 minutes, or until the metal looks clean and white. The pickle will not harm the silver if it is left in the acid for quite a while.

Go over the entire back with a scraper or fine emery cloth, until the surface is clean and shiny. Success in soldering depends on *absolutely clean* surfaces. Cover back with a thin coating of borax or liquid soldering fluid. Place tiny pieces of enamel solder (a very hard-flowing silver solder) at intervals over the back. Heat this from beneath with blowtorch until solder runs, although not necessarily until it is absolutely smooth. Take care in using this solder, as it melts just a second sooner than the silver. (Try a few pieces first, on thin scrap silver, to find melting point, and how much heat silver will stand.) Enough solder should be used so that when upper and lower parts are put together, the solder will spread over

[1] An earlier article on enameling illustrated with many examples of old and modern work, was published in the November-December, 1929, and the January-February, 1930, issues of *The Handicrafter*, Jamaica Plain, Mass.



Jewelry showing several methods of enameling. The pendant is made of heavy silver with chased design and enameled background. The brooches — deer, pheasant, rabbit designs are saw-pierced applied designs, elaborated with fine chasing and enameled background. These are the work of Eddie Nelson, Boston, Mass. Other pins and pendants are plain, saw-pierced designs applied to silver with copper backs and enameled background. They are the work of the beginning classes in enameling

and unite the entire contacting surfaces. If too much is used, it will spread out on the background and make the enamel chip off. Any extra solder on the background or walls of spaces must be removed with a scraper or an engraving tool.

File the lumps, if any, from the solder so that the bottom is fairly flat. Use the scraper to clean around lumps so solder will spread over the entire area at the next heating. Cover the piece with a thin coating of borax or soldering fluid, and lay aside for a while. Next, cut out a piece of silver, about 20 gauge, a trifle larger than the first part. Anneal and pickle this. Go over the surface lightly but thoroughly with very fine emery cloth. Borax this, then put the two pieces together evenly, holding them together with cotter keys or small iron clips. Heat from the bottom until the solder runs. Watch very closely to see that solder comes out to all edges of design, but do not overheat and burn the silver. By occasionally removing the flame for a second after the solder has started, the rest of it can be forced to run without much danger of melting the silver. A steady flame held on the piece continuously might, however, cause the silver to melt with the solder.

Pickle the silver, then file the edge to a perfect outline, even with the upper layer. If heavier silver is used, say, No. 20 or No. 18, a 1/16-in. rim may be left extending beyond the upper layer to give richness to the design. Next, the brooch should be slightly domed, or made convex. Place it face down in a wooden tray or bowl mold, and pound it gently with a round-faced wooden mallet. If you have no mold, gouge out a shallow, smooth depression in a piece of wood instead. Have ready a small block of wood with a piece of fine emery cloth glued smoothly to it. Place silver on this, face up, and rub back and forth until the bottom rim is smooth and even. If doming is carefully done, the silver will rest perfectly flat on a smooth surface. If edge is not even, hold silver flat on bench or block of wood, with uneven edge of silver at very edge of wood or even overlapping a bit. In this position one can tap down the uneven points without flattening the whole surface. Use a small-nosed mallet and tap gently until the silver "sets" perfectly flat all around. Polish the brooch, using tripoli with a felt buff on the motor. Next, boil it in a solution made by adding 1 teaspoonful of lye to 1 quart of water. This will remove all polish and grease.

Now solder joint and catch the back, placing these a bit above the exact center so that the brooch will not lean forward when worn. Use several small pieces of the same enamel solder rather than one large piece, for ease in heating. Be sure enough is used so there is no possible danger of the pieces coming off. Pickle the brooch and lay it aside while the enamel is prepared for use.

Special equipment for enameling is needed, and this will include preferably a Wedgewood mortar and pestle, medium size, or a heavy porcelain one. Firms carrying metal-work supplies usually carry Wedgewood mortars, while porcelain ones may be found at any wholesale druggists' supply company. Two one-quart or larger jars, a light wooden mallet or a hammer, and a wide-mouthed pill bottle or a small glass jar for each color, also will be needed. A box cover in which to rest pestle and mallet will prevent these from picking up particles of bench dirt which might drop into the enamel.

Blues, turquoises, greens, and lavenders are best with silver, although yellow and orange may be used. It is better to leave pinks and reds for use when one is more experienced, as they require special treatment. They "do not like" silver chemically, and must be used over a fired layer of flux.

Enamel as it comes from the manufacturer, looks like broken colored plate glass. If the pieces are large, break them up before trying to grind in the mortar, as too heavy pounding may break the bowl. It is unwise to use iron mortars for this purpose, as bits of iron will sooner or later get into the enamel and spoil it. The best way is to take out one or more pieces, wrap them in tough brown wrapping paper to prevent flying, and pound with an old hammer or end of an anvil stake, resting the wrapped enamel on an old iron or very hard wood base. Enamel is so hard it will badly mar any smooth iron surface, hence the warning to use an old hammer and base. Pound very carefully, as the enamel will soon cut through the paper and may scatter. Renew paper wrapping as necessary. In collecting scattered pieces be very sure no foreign matter is picked up with them.

The first, central, and last consideration in doing enamels is to keep everything *clean*. One speck of dirt, one bit of metal filing, or even iron rust in the water may spoil all one's work, and in most cases there is very little chance of successful repair after firing. Therefore it pays to take especial care every step of the way. Having chosen the color and broken up the large pieces of enamel, select one or more pieces which look as though they would measure about two teaspoonfuls when crushed fine. Put the selected pieces in the mortar. Rinse thoroughly with clean water to remove all particles of paper or dirt. Then leave just enough water in mortar to cover enamel, possibly three quarters of an inch. This is to keep enamel from flying out. Have bench covered with clean paper where grinding is to be done. A folded cloth placed under the mortar will soften both noise and force of blows. If the pestle does not have a wooden handle, wrap the end with cloth or adhesive tape to prevent chipping.

Rest the end of pestle on largest piece of enamel, holding it steady while giving it three or four gentle taps with the mallet. Lift pestle out and observe how much enamel has been crushed. Replace pestle, this time putting it on top of next largest piece, and tap as before. Repeat this moving and gentle tapping until enamel is evenly ground and about the

size of fine salt. Watch closely at all times and remove with tweezers any foreign particles seen in enamel or water. Pour off water and add fresh every time water becomes cloudy. These powdery particles may make cloudy or porous places in finished work. This waste enamel may, however, be saved for later use as counterenamels (necessary on the back of pieces in certain processes), or for experimental use. For this reason, the cloudy water should be poured into one of the large jars previously mentioned. When the jar is filled, the contents should be poured off into the second jar, thus leaving the fine enamel in the bottom. Any powder in the second jar will soon settle so it will be safe to empty the top water from that into the sink. After settling and drying, the powder can be removed to smaller bottles or boxes. When using a quantity of one color, the pourings can be kept separate, put in marked containers and used on small experimental trays or other work. If using only small amounts of various colors, it will not pay to keep them separate.

Always keep all colors marked with their numbers, as it is almost impossible to tell them apart otherwise. Very light blues are quite dark in the lump, and some bright reds are yellow before firing, while pink is often plain white. After the first grinding of enamel is done, remove it to a properly marked bottle. (Ground enamels should always be kept covered with water and tightly corked to keep out dirt. Freshly ground enamel gives the most brilliant colors, although it is possible to keep enamel under water for some weeks.) The grinding is repeated if necessary until a sufficient quantity is ready. It is unwise to put a large amount in the mortar at one time, with the intention of hastening the process, because the smallest particles sink to the bottom and are reduced to powder before the rest is evenly ground, thus causing waste. Grinding goes quickest and most evenly with small amounts.

A 5-in. piece of wire about ⅛ in. in diameter, with one end flattened and widened, and the other end pointed, makes a good tool for laying in the enamel. Further equipment needed are: small squares of clean old linen or cotton cloth (paper toweling or blotting paper may be substituted but are not so good); an easy-pouring small jar for clean water and one for waste; small dish to hold enamel while in use; tweezers for removing foreign particles. Arrange all of these things on clean paper on the bench, and keep the enamel covered when not in use.

The next step is cleaning the silver. It must always be cleaned just before enameling. Yesterday's cleaning will not do, as the metal may have tarnished or collected dirt in the meantime, even if it does not show. The silver has already been pickled in the sulphuric solution. Have ready rubber gloves, dish of hot water, small amount of diluted nitric acid (half water and half acid) in a small open glass, and a small stick like a brush end or orange stick. Open the window, as nitric fumes should not be inhaled. Hold brooch in hot water a minute, dry quickly, and with the little stick drop acid into each little channel in the design, working it into all corners. Work rapidly. The silver will turn black almost at once, and the nitric acid should not be allowed to stay on it more than a few seconds, as it will attack solder and also roughen the silver. Wash off at once under running water, using a clean toothbrush to get the acid out of the corners. Polish thoroughly with brass scratch-brush on lathe, keeping work wet with clean water. Turn brooch so brush gets into all corners. Repeat nitric-acid cleaning, rinsing and scratch-brushing twice more, if you are not positive the silver is clean. Then scrub with strong ammonia and white-soap solution and a brush. Rinse thoroughly. This last cleaning is to remove any possible dirt coming from the scratch-brush. Only water should ever be used on this brush, and it is wise to keep it in a covered box by itself so it will not collect particles of tripoli from other brushes or from the bench. After this cleaning, keep fingers off surfaces that are to be enameled.

Equipment for enameling: Mortar and pestle, jar of ground enamel, vial of very fine enamel, three pieces of unground enamel, glass dish, and two tools used in applying colors

If working with copper, the method is the same all through except that pure nitric acid may be used instead of diluted. Work rapidly and scrub off at once under running water. Do not scratch-brush. Repeat if dark places show.

Sometimes "gum" is added so enamel will not scatter in firing. Ten cents worth of gum tragacanth will last a class for months, but mix only small amounts, as it sometimes spoils when kept too long. Use about two "curls" of gum to several ounces of water. This dissolves slowly and should be prepared a day ahead. Occasional shaking will help. Use a small-necked bottle so gum may be poured a drop at a time. The solution should be thick but not so thick that it will not pour easily. After cleaning silver, the enamel may be laid in. Add one or two drops of gum to the color and stir thoroughly. (If the moisture is not readily absorbed when touched with corner of cloth, it probably has too much gum in it. Add more water and mix.) Take up a little moist color on the end of the tool and place it in one section of the design. Spread it so channel is evenly filled. Push particles into all corners, being sure they are absolutely filled. Turning brooch so that it gets light from different sides is advisable. Tapping edge gently with tool will help settle enamel. If enamel is too coarsely ground it will not fill corners properly. Fill channels even with surface of silver and be sure no particles are left outside the design. Remove extra moisture occasionally by touching enamel gently with corner of dampened cloth. After completion of laying it, remove all possible moisture again, then turn brooch over carefully and cover joint and catch with a thick paste of yellow ocher and water. Be sure none of this gets on the front of the brooch. The yellow ocher may be obtained in powder form from hardware or paint stores. It costs about five or six cents a pound.

A section of iron stove grating suspended on wires from the ceiling, or raised on an iron tripod, makes a good firing

place. Enamel must always be fired from beneath keeping flame away from surface of enamel, as direct flame will turn it black. (If this does happen through careless firing, it may sometimes be removed by polishing with tripoli, but it is wiser to avoid it.) Lay the enamel carefully on a small piece of very heavy wire netting (woven, not soldered variety) and place it on firing stand. Apply heat from a small blowtorch for just an instant under the silver, then take it away. Work the foot bellows just enough so flame does not smoke the metal. Repeat this warming-up and withdrawing until the enamel stops steaming. Then hold flame steady, using foot bellows gently, and heat until enamel is glazed. Watch very closely all through the heating, and remove flame the instant the surface looks shiny, as silver melts only a second after the enamel. It is wise to stop firing and look at the enamel closely, occasionally, rather than overfire it and burn the metal. In melting, the enamel will sink down in the channels so that usually another coat has to be applied to fill them evenly. Cool the brooch slowly, clean it with acid as before, then fill in the needed color and fire again.

If the enamel comes out higher in some places than the surface of the silver, it can be taken down with a file or fine carborundum stone, using plenty of water while working. Be careful not to mar the silver or it will need repolishing. After using the stone or file, it is best to wash the enamel over with hydrofluoric acid to dissolve the fine powdery sediment. Apply the acid with a small stick and wash off very thoroughly afterward. Fire the work just enough to glaze it over smoothly. Let brooch cool very slowly. When cold, brush off yellow ocher, pickle the brooch, and polish with scratch-brush. If silver has been marred, of course it will have to be polished with tripoli first.

If the design is etched or chased, the enameling process is exactly the same, but the work is much easier because there is no soldering to interfere. Pieces may sometimes be re-ënameled by first soaking them in hydrofluoric acid until the old enamel is dissolved. Use a silver tray, or some container which has been protected by an asphaltum coating, to hold the acid, as it will eat into glass. It will not hurt the silver.

This process of enameling may be used on various other articles besides brooches — on pendants, earrings, small box tops, and so forth.

Problems and Projects

WROUGHT-IRON CANDLESTICK

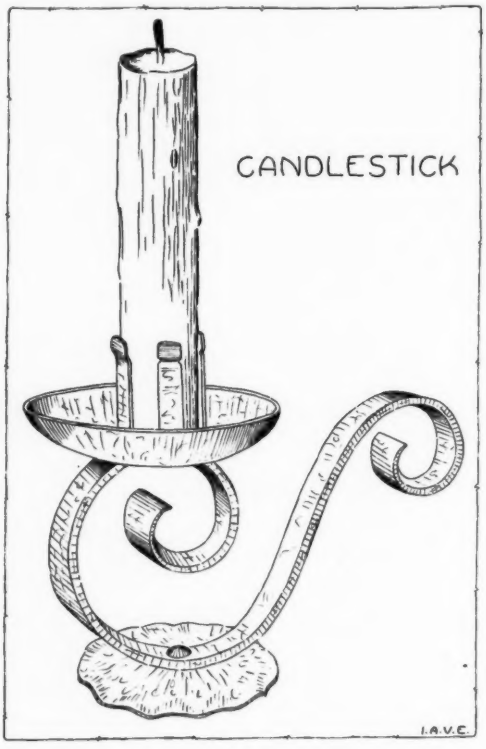
Jos. J. Lukowitz, Milwaukee, Wisconsin

(See Supplement No. 289)

The candlestick has been perpetuated for sentimental reasons. It reminds us of the dimly lighted cabins of our forefathers, and has come to be regarded as an appointment quite necessary in the furnishing of our homes. The one here illustrated has a quiet dignity and charm which makes it quite pleasing.

The making of this candlestick is simple, indeed. A piece of No. 24 gauge sheet iron large enough to cut out two pieces 4½ in. square and one piece 3½ in. square is required for the drip cup, candle socket, and base. The scroll is formed from a piece of iron ⅛ by ½ by 17½. Two roundhead rivets ⅛ by ⅜ in. are required to fasten the parts together.

Begin by making the drip cup. After cutting a circular disk 4¼ in. in diameter, shape the cup by beating it down lightly into an electrical outlet box cover as shown in Figure 1. If the metal is struck too heavily it will kink. Success lies in striking many but light blows. After the disk is slightly dished, it may be held so that just a portion of the drip cup lies over



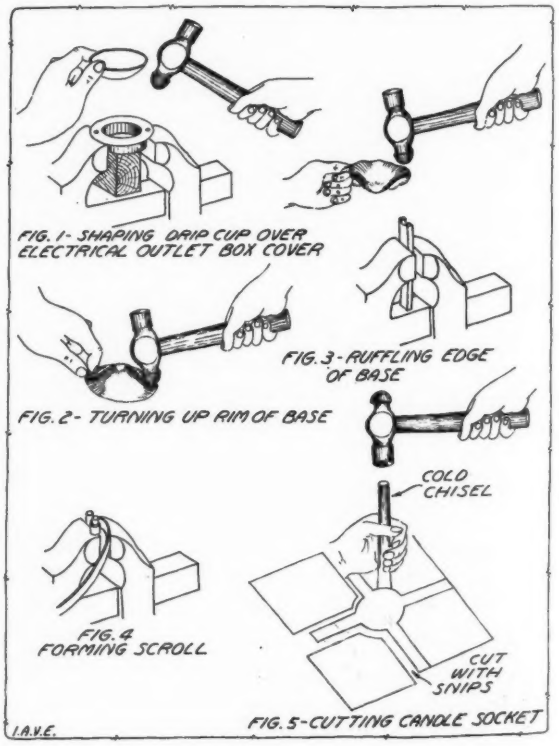


FIG. 1- SHAPING DRIP CUP OVER ELECTRICAL OUTLET BOX COVER
FIG. 3- RUFFLING EDGE OF BASE
FIG. 2- TURNING UP RIM OF BASE
COLD CHISEL
FIG. 4 FORMING SCROLL
CUT WITH SNIPS
I.A.V.E.
FIG. 5- CUTTING CANDLE SOCKET

the inside of the outlet box. When held in this position and struck with the hammer it is possible to beat it down to a depth much greater than the depth of the outlet-box cover. It is not necessary to anneal any part of the candlestick.

Next, cut the base to the required diameter, 3½ in., and dish it slightly at the center. Figure 2 shows how the edge is turned up with the hammer. This is accomplished by striking the base about ½ in. in from the edge. The ruffing or pie-crust edge is obtained as shown in Figure 3 by beating it into a hollow end previously shaped on a piece of iron. A hardwood block will answer as an excellent substitute for the iron form.

Before bending the scrolls, flare the ends of the piece to be used for the scrolls, and cover the metal with hammer marks. Figure 4 shows how the scrolls may be formed between two short metal pins held firmly in the vise. The bar to be bent is put between the pins and bent around just a little. Then the bar is slid a little farther and bent a little more, and so on, until the scroll is finished. The drawing of the candlestick is full-sized, so the scroll may be frequently tested for true shape by placing it directly over the drawing. Remember, bending a little at a time and testing frequently will make it quite easy to secure the proper shape.

The method of cutting the blank for the candle socket is shown in Figure 5. After the socket is cut, cover it with hammer marks. Then locate the rivet holes in all of the pieces with a center punch, and drill the holes. Do not bend the socket completely up to the 90-deg. bend until it is riveted in place.

To obtain a beautiful antique finish, coat the entire candlestick lightly with linseed oil applied with a rag. Then hold the metal over a gas flame until the oil is burned off. Now polish with emery cloth. Coat with lacquer to prevent rust.

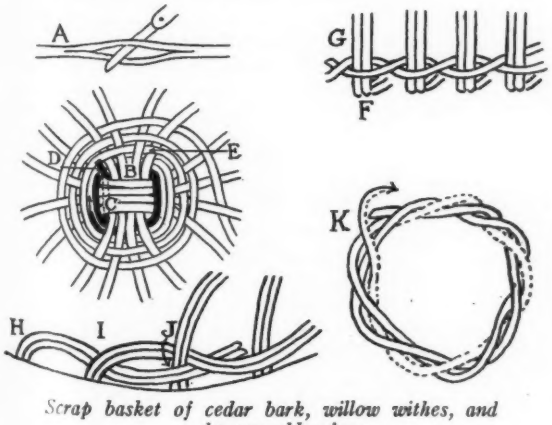
The candle socket is made large enough to accommodate the larger-sized candles.

SCRAP BASKET MADE OF NATURAL MATERIALS

Osma Palmer Couch, Hartland, Michigan

The woodsy-looking scrap basket described in this article is made of materials gathered out of doors. The spokes or rods that form the basket framework are narrow shoots cut from willow trees; the flat weavers are strips of cedar bark peeled from an old dead log; the fine weavers used for bands are wild honeysuckle vines.

Preparation. Gather about fifty willow withes from ⅛ to ¼ in. thick, and plenty of honeysuckle vine ⅛ in. thick. Find an old cedar log (an ash log soaked in a stream several weeks will also serve), hammer along its surface, cut down into the bark at one end with a knife, and peel off. Cut the bark into strips ⅜ in. wide, then split into a thickness of 1/16 to ⅛ in. Soak all material two hours. Have ready a sharp knife, scissors, awl, and pincers.



Scrap basket of cedar bark, willow withes, and honeysuckle vines

Basket Base. Cut eight willow rods 8½ in. long, and ¼ in. thick. Split four at their centers, as at A, Figure 1. Insert four others through them (see B, Fig. 1). Insert end of a fine weaver (shown black) beside the whole spokes, C. Carry it upward over split spokes and under its own point, D. Weave clockwise under four spokes and over four, continuing three times around. Then pass the weaver over two spokes and under the third, E, and keep weaving around, "over two and under one." Weave until diameter of base measures 7 to 8 in. across. Trim spokes close up against weaving.

The finished scrap basket

Basket Sides. For side spokes, cut 34 willow rods ⅛ to ¼ in. thick, 16 in. long. Using the awl, insert a pair of rods at each base spoke, two pairs at last spoke, making 17 pairs. Soak well, pinch with pincers at bending points, F, or crush rod at this point enough to bend, by hammering with a stone. Turn rods upward and keep them vertical by pulling weavers tight. Use two honeysuckle weavers in pairing or twisting stitch, G, Figure 1, carrying each weaver in succession over the other weaver and back of the next pair of spokes. Make 1 in. of this weave at base of basket (see illustration). Change to a flat bark weaver and weave a 4-in. section with in-and-out weaving, passing under a pair of spokes, then over the next pair, etc. At center of basket, weave band of pairing weave, 1½ in. wide like base. Weave upper section of flat bark in-and-out weaving 3½ in. wide. Weave pairing band at top 1 in. wide.

Border. Soak spokes well. Bend over in border shown at H, carrying each pair under pair at its right, I, and over second pair, J. Take each pair next at right all around basket.

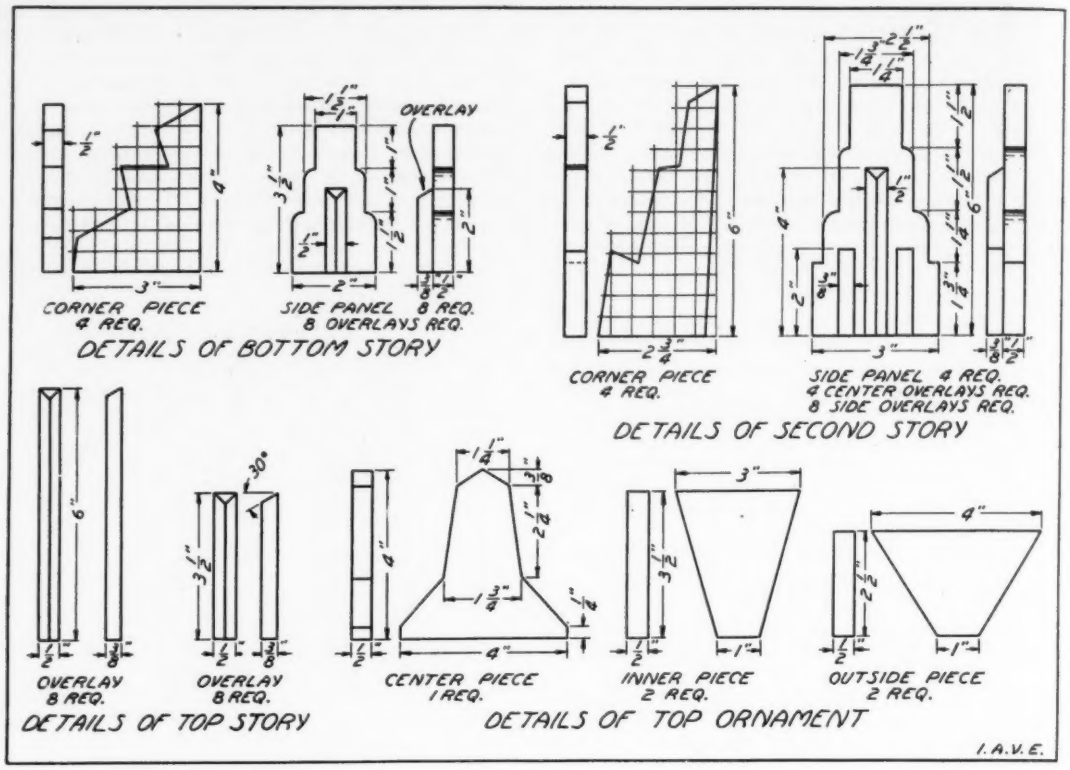
Handles. For each handle twist a long strong vine around in a circle 4 in. in diameter; twist it around a second and third time, as at K.

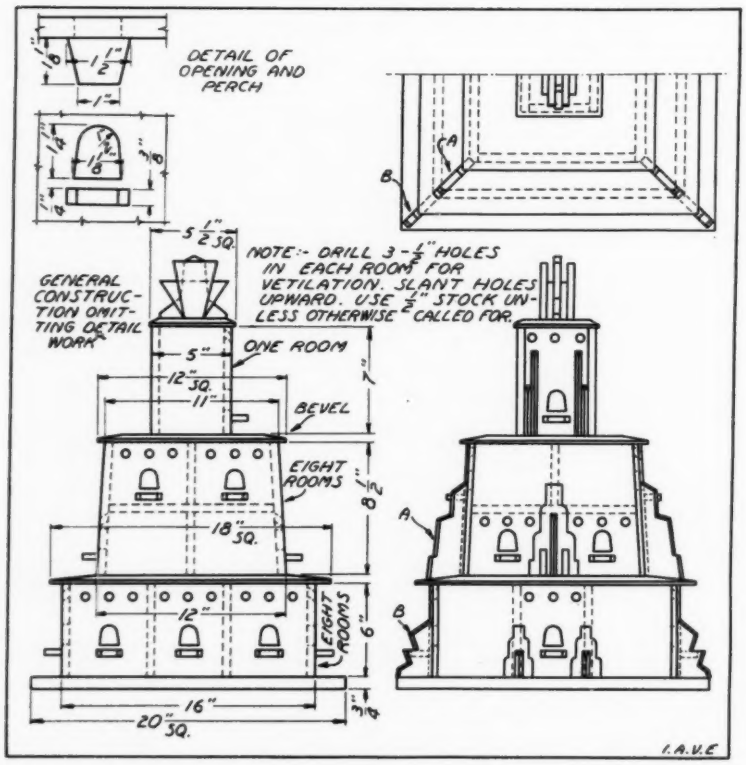
A MODERN MARTIN HOUSE

Glenn A. Johnson, Sycamore, Illinois

The project shown herewith is a 17-room martin house. Boys who are interested in birds will delight in building it. It is built of ½-in. white pine. It should be painted with aluminum waterproof paint and trimmed with black, as these two colors are in keeping with the design.

When constructing this house, each story should be made separately, then all of them are fastened together. In this way each story can be removed for cleaning. It is well to paint all joints before assembling. Finishing nails are used. These must


CORNER PIECE 4 REQ.
SIDE PANEL 8 REQ. 8 OVERLAYS REQ.
OVERLAY
DETAILS OF BOTTOM STORY
CORNER PIECE 4 REQ.
SIDE PANEL 4 REQ. 4 CENTER OVERLAYS REQ. 8 SIDE OVERLAYS REQ.
DETAILS OF SECOND STORY
OVERLAY 8 REQ.
OVERLAY 8 REQ.
CENTER PIECE 1 REQ.
INNER PIECE 2 REQ.
OUTSIDE PIECE 2 REQ.
DETAILS OF TOP STORY
DETAILS OF TOP ORNAMENT
I.A.V.E.


DETAIL OF OPENING AND PERCH
NOTE:- DRILL 3 - 1/4" HOLES IN EACH ROOM FOR VETILATION. SLANT HOLES UPWARD. USE 1/2" STOCK UNLESS OTHERWISE CALLED FOR.
GENERAL CONSTRUCTION OMITTING DETAIL WORK
ONE ROOM
BEVEL
EIGHT ROOMS
EIGHT ROOMS
A
B
I.A.V.E

be set and filled to prevent rusting. The openings are made by using a 1-in. auger bit at the top and finishing the bottom with a jig saw or coping saw. The ornaments and overlays must be nailed on securely.

CARVING IN KEENE'S CEMENT

Delmar W. Olson, Student, and Everett G. Livingston, Industrial-Arts Department, Iowa State College, Ames, Iowa

The all-round value of Keene's Cement[1] as an instructive medium for the industrial-arts teacher seems to be increasing with each bit of experimentation to which it is subjected. In the May, 1933, issue of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine,[2] its uses and possibilities as adapted to casting in molds were described, and in the August[3] issue its adaptation to turning in the lathe was presented. Still another use for which it has been found very fitting is that of carving and modeling.

The accompanying illustrations of finished plaques carved from slabs of the cement, show that here is a medium for art expression and appreciation which seems to possess great possibilities. All the creative individuality expressed in freehand art can be employed in the carving of plaques, yet the pupil need be neither a genius nor an artist to produce a desirable and beautiful piece of work. The carving of the plaques presents an excellent opportunity for the teaching of perspective, beauty and harmony of design and color, balanced composition, and the fascination of scupturing.

[1] Keene's Cement may be purchased at any building-supplies firm.
[2] Livingston, Everett G., "Ornamental Concrete Work," pp. 192–193.
[3] "Something New in Ornamental Concrete Work," pp. 257–258.

Plaques designed and cut by Delmar W. Olson

As to the design to be used, whether created or copied, it is plain that it should vary with the ability of the pupil. Simple geometric figures and designs, monograms and insignias, cut into slabs and tea tiles are perhaps sufficiently elementary for junior-high-school pupils. From these, a next step would be the cutting of simple silhouettes, finished in black and white enamel, such as the one shown in Figure 1. More difficult designs to challenge the ability of the best student can always be secured. High-school students may begin with these same projects or with more complex ones depending on the individuals. The point is that for any pupil there can be found designs within his capacity of execution. The likeness of "Popeye," Figure 2, was taken from a comic section of a newspaper; the dog, "Prince of Wails," Figure 3, from a pencil sketch; the "Boy Fishing," Figure 4, from a book cover; and the "Iowa State Campanile," Figure 5, from a photograph. Of course, a rendering from life or nature is not impossible either.

Before beginning a plaque, it is desirable to have on hand the tools necessary for the carving. The writer used at first an ordinary set of wood-carving chisels, but these were slightly cumbersome and clumsy, so an inexpensive set of linoleum block cutting tools was tried and found exceedingly adaptable. Later a set of small chisels was made from ordinary black iron and tempered to hold a fairly sharp edge. These tools are so simple that the pupil can make them himself, after a bit of experience with the carving has shown him what kind of chisels are most suitable for his individual needs.

After the design or composition has been selected, it should be transferred to a sheet of paper from which it can then be traced on the slab of cement with carbon paper. The size and shape of the design will determine the size and shape of the slab, and of the form needed for casting it.

The form may be made of either wood or metal, but the latter is better suited to the purpose. To make an all-metal form, simply cut a piece of galvanized iron large enough to make the bottom and four sides of a pan about three fourths of an inch deep. The sides should have a slight flare so that the pan will be slightly larger at the top. The corners may be soldered, but that is not necessary if they fit closely.

The slab for carving should be one half to three fourths of an inch thick. The amount of Keene's Cement required to make the cast is about one-fourth more than the amount of dry cement required to fill the form to the desired depth. To prepare the cement for casting, simply add water and mix it thoroughly in a pan or bowl, making the consistency such that it is easy to handle without being too watery. A firm mix will be ready for carving much sooner than a wet mix.

Preparatory to casting the slab, the form should be thinly coated with some kind of oil or grease; equal parts of paraffin and kerosene make a good "dope." Following the filling of the form, the air bubbles should be brought to the top by banging it on the bench several times. It is a good idea to imbed a flexible-wire loop in the back for the purpose of hanging the completed plaque. The setting time depends upon the consistency of the mix and the drying conditions of the room, but the cement usually becomes sufficiently strong to bear handling in from six to ten hours.

When the slab has been removed from the form, place it on a flat surface for carving, trace the design on it, draw up a chair, and you are ready to begin whittling. There are primarily three techniques involved in any carving. The composition may be done in full relief, much the same as the plaque of "Popeye." By this method the background is cut deeply away from the figures, making them appear more natural and in greater depth, standing well out from the background. Another technique is that of flat relief in which the background is not cut away so deeply. This is the more simple of the reliefs and lends itself especially well to silhouettes; that of the "Boy Fishing" shows flat relief. Then there is the technique called incising in which the figure itself is cut out, leaving the background intact. This is adapted to the carving of geometrical shapes, designs, and monograms and, though not so effective, is the simplest of all forms of carving.

Using the chisel which seems to be most effective, by trial and error, carve out the design until it appears as you think best. In simple silhouettes the same depth of cut is made over the whole design, while in "relief" the depth of the cut varies

Martin house described on pages 187 and 188

as the figure is near or far from the observer. It is a good plan when the "relief" technique is to be used to begin the cutting on the objects which are to be nearest in the perspective, working gradually back to the ones farther away. The cement is more easily cut before the slab gets 24 hours old, although it remains workable for several days if kept wrapped in wet cloths when laid aside. Detailed explanations of how to cut out a plaque can hardly be given, since each design requires slightly different attack. The experiences acquired on the first one are far better than any written explanation. After the composition has been completed, it is sometimes desirable to lighten the plaque by shallowly hollowing out the back side. The outside edges may be straightened and squared with a plane or a flat chisel.

With the plaque all cut out, let it dry for a day or two, depending on how wet it is when finished, dust off any gritty surfaces with a stiff brush or steel wool, and it is ready for a thin filler coat of shellac or flat varnish. For best results do not omit this filler coat. When it is dry, mix up a bit of burnt umber (ground in oil) with turpentine to about the consistency of thin cream. This mixture is known as "antique." With a rag or brush, swab the plaque with this antique as if it were a wood filler, getting it into all the cracks and crevices. Let it dry again for a few minutes, then wipe off the excess, leaving the cracks and crevices dark with the umber in order to lend high lights, giving depth to the design. The pupil, after some experience, can tell from which portions to wipe most of the antique, controlling his lights and darks for greatest effect. Let the plaque dry again for about 12 hours. Frequently this finish alone is exceedingly appropriate, since it lends an appearance of oldness and mustiness often desirable.

After this antique has dried, the plaque may be painted as desired with ordinary tube colors thinned with linseed oil and turpentine, or it may be gilded or bronzed. In fact, the nature of the design indicates the kind of finish to be used. To produce the antique finish so desirable in colored plaques, give the painted surfaces a final coat of the "antique," letting it dry a few minutes, then rub it carefully off the features to be highlighted, varying the degree of light or dark as desired.

A USEFUL ANVIL

W. R. Challoner, Appleton, Wisconsin

The anvil described in this article is made of a standard rail weighing 100 lb. per yard. It may be purchased either from a steel supply house, or from a scrap yard. If the rail has been used, care should be taken to choose a piece that is not worn down too much on one side, as there may not be material enough to keep the proportions shown in Figure 1.

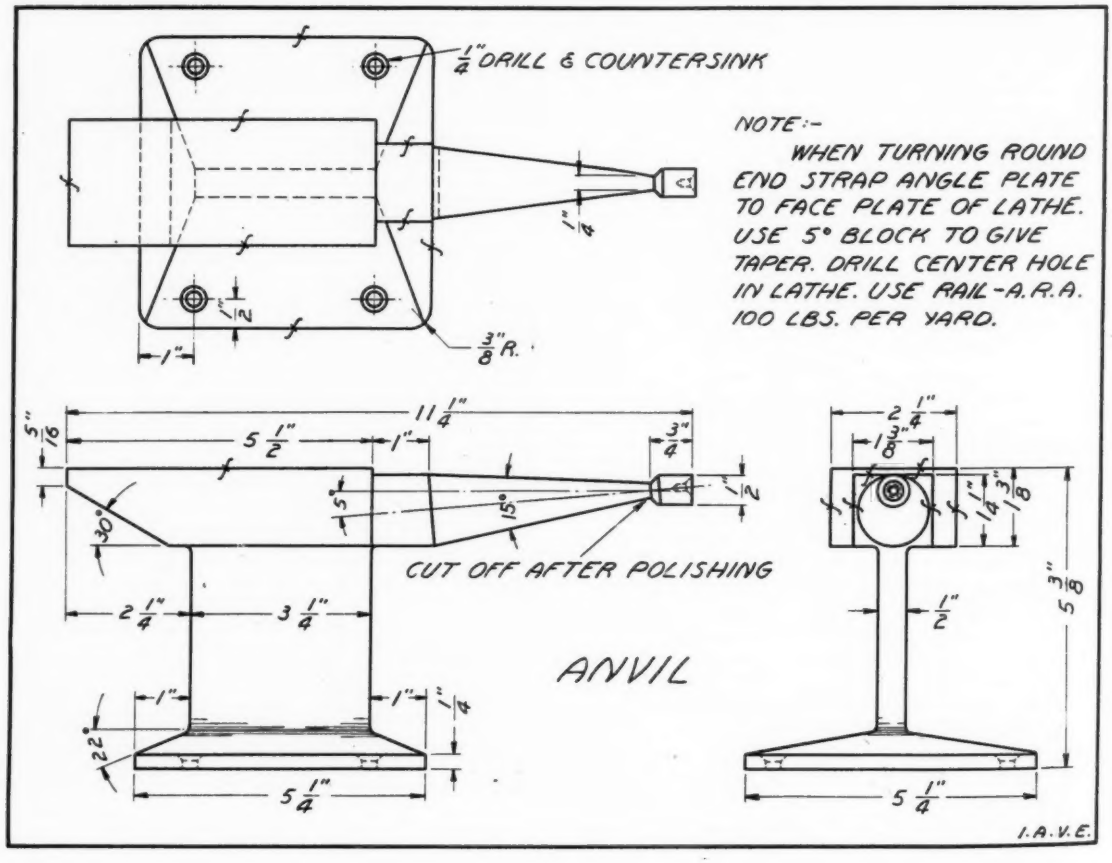
Cut the rail to length. Lay out the web and drill a row of 3/8-in. holes across the web and as near the base as possible to a point where the base is cut off. Then set the rail up in the power saw and saw lengthwise of the rail to meet the holes near the head. Do this on both ends and then chip the stock between the holes and knock out the web and the part of the base not wanted.

The rail also may be cut to size with a torch, but the material will become so hard at the cut that it will be difficult to machine.

The first shaper operation is that of roughing off the top of the anvil and then the sides until just a little corner of the head remains. The base should be shaped crosswise, as shown in Figure 2, and the shaper head set to the proper degree so as to make the angle. At the same time shape the web to the layout lines or remove the lugs left by the drilling.

On the back end, the angle on both base and head as well as the web can be shaped at the same setting.

Next, lay out the nose of the anvil and rough it out so as to leave the point about ½ in. square. Shape back to a point where the drop in the head begins, thus removing part of


1/4" DRILL & COUNTERSINK
NOTE:-
WHEN TURNING ROUND END STRAP ANGLE PLATE TO FACE PLATE OF LATHE. USE 5° BLOCK TO GIVE TAPER. DRILL CENTER HOLE IN LATHE. USE RAIL-A.R.A. 100 LBS. PER YARD.
3/8" R.
CUT OFF AFTER POLISHING
ANVIL
I.A.V.E.

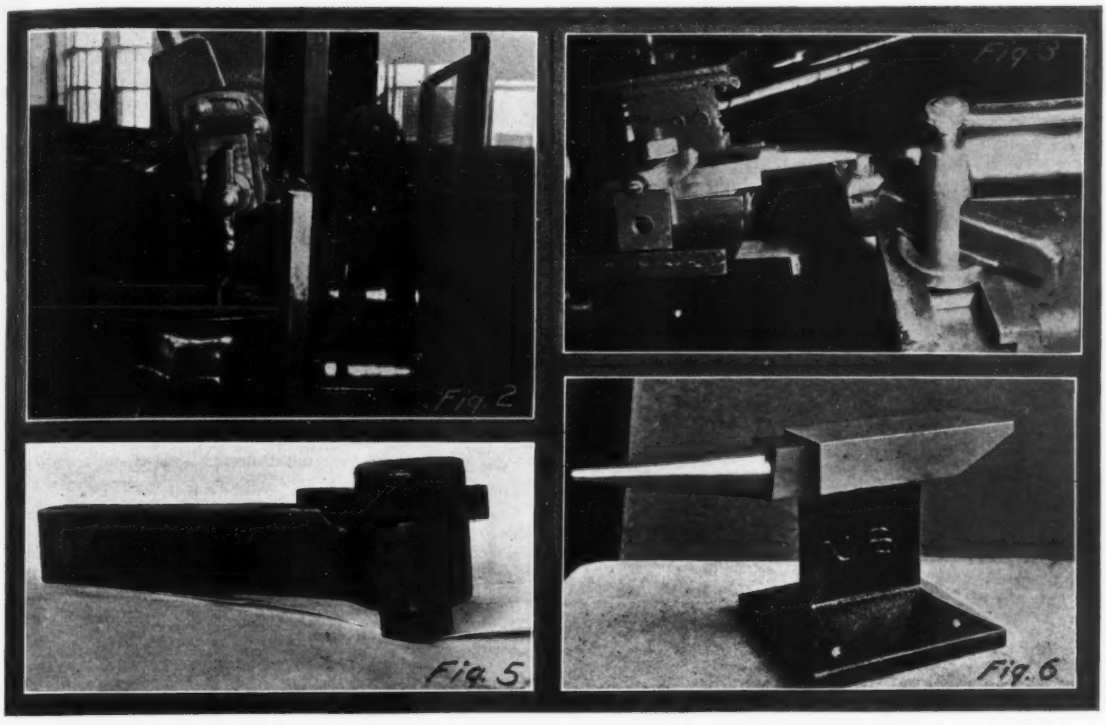


Fig. 2. Anvil set up in shaper. — Fig. 3. Anvil set up in the lathe for turning the nose. Note the angle plate and wedge. This is a 5-deg. wedge. Note the piece of paper between the wedge and anvil. — Fig. 5. Armstrong tool holder with shear-cut tool in place. — Fig. 6. The finished anvil

the stock from the nose, making ready for the lathe work. Figure 3 shows the lathe set-up.

In order to set the job up in the lathe, fasten an angle plate to the faceplate of the lathe, and place a 5-deg. wedge-shaped piece between the angle plate and the anvil to give the 5-deg. angle shown in Figure 1.

Then clamp the anvil to the angle plate with a piece of paper between the angle plate and the anvil, and also between the faceplate and wedges, to keep these parts from sliding.

The anvil should be placed head side to the angle plate and square with the faceplate, and in such relation to the center of the lathe that the ½-in. square on the nose of the anvil is in line with the center of the lathe.

Next, drill a center hole in the end of the anvil using a combination center drill. Then bring the lathe center in contact to support the nose of the anvil when turning.

Rough off the taper by the step-turning method until each step just clears the flat on the top side of the anvil. This will leave enough stock for the next turning operation.

Next, set the compound on the lathe 7½ deg. off the center line and lock the carriage. Using the compound as a feed, turn the nose of the anvil to the proper size. Leave the end on the nose about ½ in. in diameter at the lathe center and about ½ in. long. This permits the center to be cut off when the nose has been turned and polished, after which the end is rounded up with a file. If a tool is used after the end has been cut off, be very careful not to get caught, as the anvil is then supported entirely by the angle plate, and an accident may result.

If the lathe that is used is equipped with a taper attachment, by all means use it.

Now back to the shaper for the finishing. Shape the drop part just back of the turned nose. Then finish the top and sides to make sharp corners. In order to get a smooth cut on this surface use the shear-cut tool shown in Figures 4 and 5.

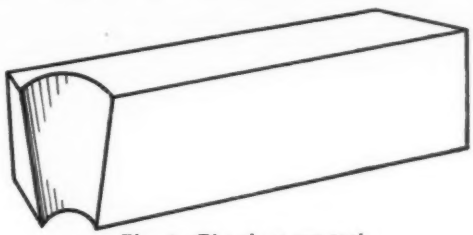


Fig. 4. The shear-cut tool

The Armstrong tool holder with the shear-cut tool bit in place should be placed in the shaper with the tool to the back side. This makes a gooseneck tool, and one that will not chatter.

Figure 4 shows how to give the correct shape to the cutting edge. It is rather hard to get the right shape to produce the best results. To one who has never used a tool of this kind, some experimenting may be required. The tool should cut against the work so that the chip is pushed over the surface to be cut.

To get best results, a good grade of cutting oil should be used. This will help to secure a smoother job. On mild steel a cutting compound will answer. Always use a light feed and slow speed. The result should be a very smooth surface, and one that requires very little if any finish unless a polish is required.

First take the stock off with a round-nosed tool, leaving a few thousands to be removed with the shear-cut tool. Use a good grade of cutting oil and run the machine very slowly to get the best results on this hard material. Then use the shear-cut tool.

Next, drill holes in the base and countersink them for wood screws. Then paint the base and web.

This anvil is fine for the home workshop, or for the school art-metal department. In fact, it will be found a handy addition to any shop.

A BUTTERFLY COFFEE TABLE

V. L. Pickens, Supervisor Industrial Arts,
Kansas City, Missouri

The butterfly table described in this article has proved to be a most practical and popular piece of furniture. Its graceful lines fit into almost any living room. As a project it lends itself readily to the needs of the ninth-grade pupil. The top furnishes the glue joint, and the rule joint may be made by hand or machinery, depending on the learning units the instructor wishes to teach. The legs furnish turning which is rather simple. The joining may be planned to meet the needs and ability of the young craftsmen. The butt joint fastened with screws, as shown in the drawing, is the simplest and easiest method. It may be assembled with dowels or, if the pupil is skillful enough, he may use the mortise-and-tenon joint. If the mortise-and-tenon joints are draw-pinned, the table will hold together as long as the original butterfly tables have.

Maple and walnut are the ideal woods for this little table. The one shown in the picture is of maple finished a light brown with a golden undertone.

SPECIFICATIONS:

1. *Material:* Maple.
2. *Finish:* Brown with golden undertone.

Sponge and sand all parts before assembling. Dissolve ¼ oz. of potassium dichromate in 1 qt. of hot water. Apply this to the table. Wipe off excess. Sand lightly when it is bone dry.

Dissolve ¼ oz. of brown walnut stain in 1 qt. of hot water. Apply this to the table. Wipe off excess. Sand lightly as before.

Apply one coat of four-hour varnish reduced 20 per cent with turpentine and rub with 5/0 sandpaper. Dust carefully.

Apply the second coat and rub down with 7/0 sandpaper and water. Apply the third coat and rub down with pumice and water. Clean table with water and dry with chamois. Polish with a good furniture polish.

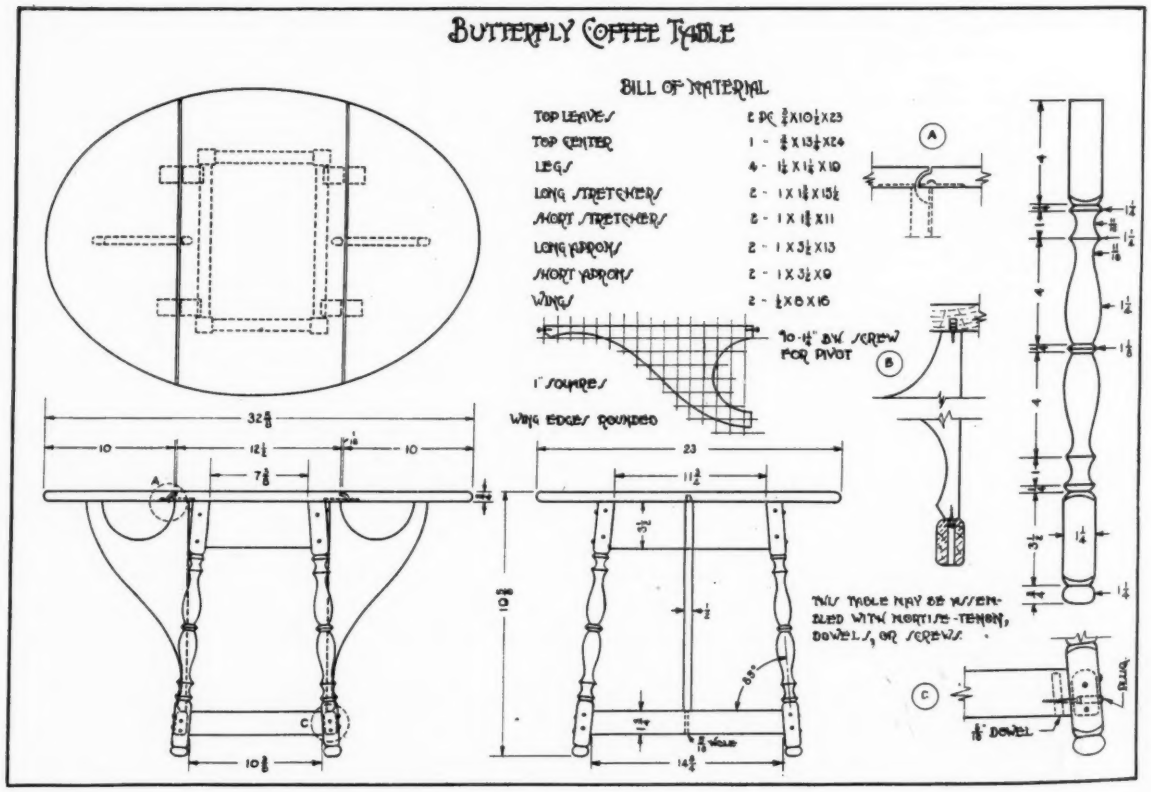
It is always best to finish a scrap piece of maple first to insure proper color tone.

Butterfly coffee table

Bill of Material (see dimensioned illustration).

JOB PLAN — *Procedure:*

1. Make out bill of material.
2. Get material and check it.
3. Glue up pieces for top.
4. Square all pieces to dimensions.
5. Make template for legs.
6. Turn legs, sponge, and sand on lathe.
7. Cut miters on aprons and rails.
8. Locate and bore holes for a dowel near ends of each apron and rail.
9. Glue dowels in place.
10. Locate and bore holes for screws in legs and ends of aprons and rails.
11. Number parts.
12. Assemble with screws without glue.
13. Test for accuracy.
14. Locate holes in center of long rail for wing pivot.


BUTTERFLY COFFEE TABLE
BILL OF MATERIAL
TOP LEAVES 2 PC ⅞ X 10½ X 23
TOP CENTER 1 - ⅞ X 13½ X 24
LEGS 4 - 1½ X 1½ X 19
LONG STRETCHER 2 - 1 X 1⅝ X 15½
SHORT STRETCHER 2 - 1 X 1⅝ X 11
LONG APRON 2 - 1 X 3½ X 13
SHORT APRON 2 - 1 X 3½ X 9
WING 2 - ½ X 8 X 16
1" SQUARE
WING EDGE ROUNDED
10-1½" BW SCREW FOR PIVOT
A
B
C
DOWEL
THIS TABLE MAY BE ASSEMBLED WITH MORTISE-TENON, DOWELS, OR SCREWS.

15. Locate and mark place on inside aprons for screw holes to hold top.
16. Take apart, bore holes for screws and pivot.
17. Size ends of rails and apron, with water thinned glue.
18. Reassemble with glue, drawing screws up tightly.
19. Make rule joint on top.
20. Lay out recesses for hinges.
21. Place hinges in place with screws.
22. Lay out ellipse on bottom side and saw to line.
23. Round edge.
24. Lay out and cut the two wings.
25. Round edges.
26. Place screw in bottom part of wing.
27. Set screw in place in bottom rail.
28. Place a straightedge across top of aprons — scribe line across two top pieces of wings even with top of aprons.
29. Saw 1/16 in. below this line.
30. Mark place for pivot and all screws.
31. Remove wings.
32. Place screw in top of wing directly above lower screw.
33. Place thumb tack in outer tip to act as slide.
34. Put top hinge side up on bench and place assembled table in place.
35. Bore holes for pivot and screws.
36. Assemble.
37. Finish (see specifications).

The numbers below refer to learning units listed by the A.V.A.

It will be noted that the machine learning units have been cut to a minimum. Most of the work, however, can be done on a machine if the instructor wishes.

LEARNING UNITS: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 17, 18, 19, 20, 24, 25, 26, 27, 28, 29, 30, 34, 35, 36, 39, 40, 43, 45, 46, 47, 50, 52, 59, 71, 72, 73, 91, 93, 97.

The jointer: 4.

The band saw: 4.

The turning lathe: 4, 5, 6, 7, 8, 9, 10, 12, 13, 14, 17, 19, 20, 27.

FLOATING MINNOW BUCKET

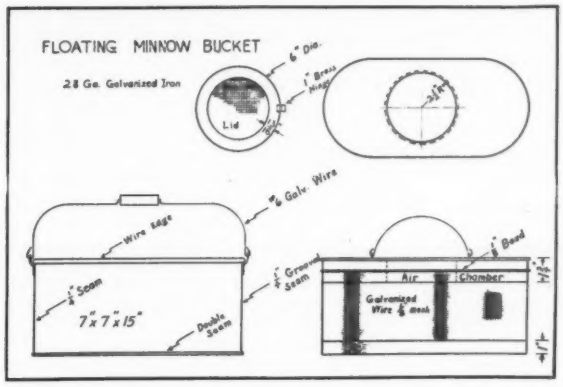
Byron Davidson, John G. Carlisle Junior High School, Covington, Kentucky

A bucket of the type described in this article seems to have the advantage of keeping the bait alive longer than the conventional round ones found in most stores.

In constructing the air chamber, double-seam the top to the side and solder the seam; then make a ⅛-in. bead around the side. Turn a burr on the inside of the lower edge. Make a collar for the hand hole, burr both edges, put in place, fit the bottom in position and solder all seams air-tight. Make the bottom tray 1 in. high, then cut the wire mesh to the correct size, allowing about ½-in. lap on the end. The mesh fits on the outside of the air chamber up against the bead, inside of the bottom tray. Spot-solder the bottom of the mesh to the tray, then the top to the air chamber. Solder the ends of the mesh together.

To make the lid, cut a ring and burr the edge. Then cut wire mesh and another ring to fit inside of the burr on the first ring. Place both inside the first ring and set down the burr edge with a mallet. The lid is fastened to the air chamber

Floating minnow bucket



with a brass hinge. There are several methods of fastening the lid, but that is left for the student to work out. He should examine several "store" bucket catches until he finds one to suit him.

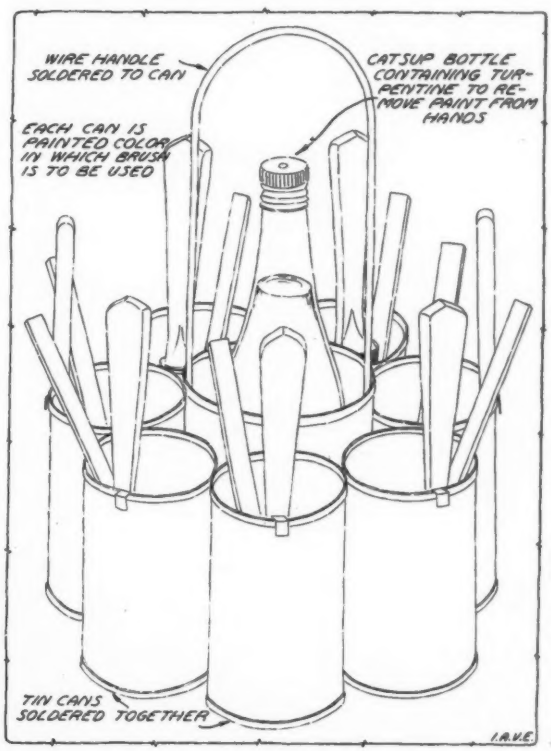
Minnows stay alive much longer if a piece of ice is allowed to melt and drip into the water. A round tray for ice may be made to fit loosely in the hole through the air chamber. Solder three ½-in. galvanized-iron strips to it and bend the ends to right angles to support the tray. This does not interfere with the closing of the lid. The tray should have two or three ⅛-in. holes punched in the bottom.

BRUSH CONTAINER

Jos. J. Lukowitz, Milwaukee, Wisconsin

A good brush container is a very essential piece of equipment for the finishing room. The one shown here can be made in 10 or 15 minutes and has a number of commendable features.

One of the problems and annoyances of the finishing room is the using of the wrong brush. For example, using the brush which has just been used in green, in the white. When the


WIRE HANDLE SOLDERED TO CAN
CATSUP BOTTLE CONTAINING TURPENTINE TO REMOVE PAINT FROM HANDS
EACH CAN IS PAINTED COLOR IN WHICH BRUSH IS TO BE USED
TIN CANS SOLDERED TOGETHER
I.A.V.E.

Brush containers

boys see before them a number of brushes each in a can painted a different color they are not likely to use the wrong brush. Each brush has a small strip of tin tacked to the handle and bent over the can so that the bristles do not rest on the bottom. The brushes are suspended in turpentine.

The paint paddle in each can is always at hand and this, too, is a valuable feature which will be appreciated, for boys are known to use any piece of wood, no matter how large and thick, to stir the paint or enamel. After stirring, the paddle is returned to the can and is ready for the next stirring. The catsup bottle containing turpentine for the hands will keep the washroom sinks, door knobs, and doors free of paint.

Devices such as these develop in the boys some understanding and appreciation of the importance of system and order, and it has been found that boys coöperate in this sometimes vexing problem of the care of brushes in the shop when some such simple and adequate means are provided for the care of brushes.

Some Questions Answered

FINISHING CARVED SURFACES

978. Q.: I wish I could get some help in finishing a small mahogany box, the top of which is intricately carved. This particular mahogany is quite porous. I should like to stain the box a rich, dark-red mahogany, and I think a dull finish is to be preferred, but I don't know how to go about putting a finish on a carved surface. I shall appreciate your suggestions. — *H. J. P.*

A.: Since you do not state whether the box is new or to be refinished, I shall assume that it is in the white. First, use a new but stiff-fibered scrubbing brush to thoroughly clean all the carving and at the same time aid in slightly rounding the sharp edges of the work, since if these have not been properly sanded slightly after the carving tool is finished, then these edges will later wear white.

Second, apply a coat of mahogany oil stain, made on a dyestuff and not a pigment base. This stain should be applied with a stiff-bristle brush in much the same manner that a stencil is applied to a packing case. The brush should have but little stain and should be handled at right angles to the work in a light twisting or circular motion. If desired, the more prominent portions may be wiped with a cloth while still wet so as to produce the effect of highlighting. The work when stained should be set aside in a warm place to dry at least twelve hours.

Third, the work may then be given a coat of shellac-mixing lacquer and 2-lb. orange shellac, 50–50. This should be applied with as little brushing as possible in order to avoid picking up the stain coat. This shellac must be applied with a soft fitch or bear carrying as little material as possible and still cover the work without producing sags or drips. Some finishers do this work overhead, as it were, by arranging some method of holding the work higher than the brushing would be done ordinarily and then having the handle of the brush lower than the bristles. In case a spray gun is available then the problem ceases to exist, since a light spraying will do the work perfectly. Let the first coat of shellac dry thoroughly, then use the dry fiber brush to carefully rub the carving smooth. Then apply a second coat of shellac lacquer. Allow it to dry and then rub with crude oil and a trace of FFF pumice stone and a stubby paintbrush or regular rubbing brush. Wipe the piece clean with a soft rag and the fiber brush. It is not practical or necessary to fill carved work which is never given a bright or heavy varnish finish. — *Ralph G. Waring.*

DESIGNING CENTRIFUGAL PUMPS

979. Q.: In my fourth-year mechanical-drawing class we are using Tracing Supplement No. 224, from the November, 1931, issue of your magazine. The project is the centrifugal pump which was submitted by August Flam, of Los Angeles, Calif. We have run into difficulties concerning the designing of the impeller. The tracing does not show the impeller very clearly. I have tried to find some text or reference book which would give a good explanation of water impellers, but I can't seem to locate just what I want. — *C. B. B.*

A.: Chapters II and XVI in the book *Centrifugal Pumps,* by R. L. Dougherty, published by McGraw-Hill Book Co., New York City, give all the information your correspondent needs to design pump impellers.

In addition I have secured valuable data and a wealth of information on pump and impeller design from Bulletin 119 and 122 issued by the Goulds Pump Co., Seneca Falls, New York. There are numerous other reliable sources of information, however, and I am sure your subscriber will not only find these adequate, but easily obtainable.

Also the following firms issue bulletins and catalogs which I have found helpful on pump and impeller design:

1. Fairbanks Morse Co., 900 So. Wabash Ave., Chicago, Ill.
2. Lawrence Pump & Engine Co., Lawrence, Mass.
3. Schutte & Koerting Co., Philadelphia, Pa.
4. Terry Steam Turbine Co., Hartford, Conn.
5. Worthington Pump & Machinery Co., 115 Broadway, New York City. — *August Flam.*

ALCOHOL FOR MIXING SHELLAC

980. Q.: Does a cheap grade of alcohol affect shellac? — *L. W. B.*

A.: The alcohol used in shellac must be particularly adapted to the purpose. Radiator antifreeze alcohol may not be used. One type containing kerosene or other evaporation delaying material will prevent the shellac from drying and will invariably cause the sanding paper to gum up. The other type, "Methanol," practically a pure wood alcohol, should not be used either as a radiator alcohol or shellac reducer, as the fumes may easily cause blindness in some instances of unsuspected susceptibility, this in spite of the clean bill of health given Methanol by the Bureau of Mines and the manufacturers. The American Chemical Society is doing all it can to discourage the use of this type of alcohol. The "proof" mark of 180 is no criterion of purity or adaptability for use in shellac solutions. Insist on a type guaranteed for this work. — *Waring.*

Associations, Conventions

THE WESTERN ARTS CONVENTION

The fortieth annual convention of the Western Arts Association was held at the Statler Hotel, Detroit, Mich., March 21 to 24, 1934.

The general attendance was better than last year, although the industrial-arts sessions were not well attended. This is especially to be deplored because the programs for all of these meetings were very strong and the speakers — experts in their respective fields — were deserving of a wide hearing. Probably the association will do well to take into account that under present conditions, industrial-arts members are usually not permitted to absent themselves from their duties for four full days. The experience of associations such as the Michigan Industrial Education Society, the Illinois Vocational Association, the Indiana Industrial Education Association, and others, shows that a great amount of good work can be done at a convention, the program of which is so arranged that all of the sessions can be held in two days of concentrated effort. The day of the convention spread out over four or more days for school teachers has gone with the day of the small class for the shop teacher, and if attendance means anything at a convention, this fact should be taken into account.

The five industrial-arts sessions spread over the four days, presented excellent selections. In the first one devoted to guidance, Dr. Myers of the University of Michigan, emphasized the fact that the word *guidance* presupposes two sets of differences. For instance, in vocational guidance the individuals have varying qualifications and the occupations have varying requirements. The counseling in vocational guidance, therefore, must consist of personally aiding individuals in studying these two sets of differences. There can be no group counseling any more than there can be group diagnosis for the sick. He also stated that the counsellor must be versed in the techniques of counseling and that he should be specially trained for his job; that the setting for the counseling must be favorable, and that the idea of counseling while in charge of a large class is unthinkable.

Mr. J. Ray Stein, principal of the Central High School, Akron, Ohio, in his talk, outlined a practical program of guidance.

At the first general session, Alfred G. Pelikan, president of the Western Arts Association and director of the Art Institute and of public-school art, Milwaukee, Wis., pointed out the need for the school to provide the broadest possible education to fit the child of today into the surrounding in which he must live, and that the arts cannot therefore be overlooked in the educational program of this age.

Mrs. Laura Osborn, president of the board of education at Detroit, decried the penny-wise and pound-foolish tendency discernible in so many cities which by curtailing educational opportunities, subject the child to the temptations of the street. She pointed out that it is better for the public to spend money for education than to increase the amounts already being spent for police, prisons, and hospitals. Preparation of character, rather than reparation, should be the watchword. She voiced the conviction that the arts are the humanizing influence in educating the whole child.

Paul C. Cressman, assistant state superintendent of public instruction, Lansing, Michigan, substituting for Dr. Paul Voelker, state superintendent of education for Michigan, emphasized the necessity of educating the child of today and tomorrow so that he may not only discover what he is best suited for, but also attain his aspirations.

Dr. Frank G. Baker, president of the Milwaukee State Teachers College, Milwaukee, stated that in the civilization of the future, the unemployed must be prepared to busy themselves with the production of the non-material things of life — religion, art, music, literature, etc. — and pointed out that, as these imperishables become more and more beautiful, the request for them will increase.

At the Thursday morning industrial-arts section, Paul C. Cressman, in speaking on the "Effect of the New Deal on Teacher Training," emphasized that teacher trainers must not forget that their trainees will teach largely as they have been taught. For that reason the aspiring teacher must not only be taught how to do certain things but also how to teach others how to do them. He called attention to the fact that grading is largely done on subject matter and not on objectives. For instance, a boy in the printing class of the junior high school, because of the poor quality of his work in the print-shop, may receive a very poor grade, where, as a matter of fact, he should receive the grade of excellence because he has demonstrated to himself that he should not take up printing as a vocation.

In his talk on "Supervisory Responsibilities in Interpreting the Present

(Continued on page 10A)

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(Continued from page 8A)

POLISHING GRAIN

The Norton Company, Worcester, Mass., has issued an instructive booklet of 24 pages describing the development and function of metal polishing with the use of alundum grain. It tells the "how" and "why" of the development of a suitable polishing grain for the different forms of polishing, and lists a number of standard sizes of alundum abrasive grains. It also presents factors which abrasive grain must possess for efficient polishing.

NEW BOOKLET ON STEEL

The Inland Steel Company, Chicago, Ill., has just issued a new edition of their booklet on *Making Steel.* The booklet contains 18 pages, and tells briefly and simply the story of how steel is made, bringing all the information up to date and eliminating the use of technical terms. A number of illustrations descriptive of the subject material, are included.

NEW SALES MANAGER

The C. F. Pease Company, 813 North Franklin St., Chicago, Ill., announces the appointment of Mr. Frederick W. Bensing as eastern sales manager. He will be in charge of the eastern sales office at 254 Fourth Ave., New York City.

Summer School News

Summer Courses at Chicago Technical College

The Chicago Technical College offers an intensive, accredited six-week summer course in mechanical and technical subjects. These include mechanical drawing, architectural drawing, designing, mathematics, and physics. The courses are intended for persons who desire to work for promotional credit, and for those who want to be prepared to take over manual-training classes.

Information concerning any of these courses may be obtained by writing to Mr. Charles W. Morey, Chicago Technical College, 118 East Twenty-sixth St., Chicago, Ill.

Associations, Conventions

(Continued from page 194)

Trend of Industrial Arts," Charles F. Bauder, director of vocational and practical-arts education, Philadelphia, Pa., very ably outlined the duties of the supervisor. Although he based his talk on experiences obtained in a large city, his suggestions can be used equally well in smaller communities.

Mr. Clayton R. Wise, assistant superintendent of schools, Cleveland, Ohio, speaking on the "Place and Future of the Industrial Arts in the Junior High School," pointed out that the present trend is toward diversifications. This, he says, requires better teaching, better evaluation, better testing, and the need for extending the work, not only to the boys, but also to the girls. He also mentioned that because of the increased class size, teachers ought to receive more and more training in properly organizing their instructional material.

At the industrial-arts section Friday morning, Charles A. Bennett, editor of the Manual Arts Press, Peoria, Ill., in his incomparable manner, rehearsed the history of industrial-arts work in his talk on "The Historical References to the Terms We Use." Dr. William E. Warner, professor of industrial-arts education, Ohio State University, in his "Needs and Accomplishments of Industrial Arts Research" outlined in a masterly manner, the requisites for research and showed what and how the researcher must approach the problem which he has set for himself if he wants to produce a creditable job.

At the Friday afternoon industrial-arts section, O. E. Sink, professor of industrial arts and vocational education, Ball State Teachers College, Muncie, Ind., in his talk "Value of Organization in Industrial Arts Classes," emphasized that under present-day conditions the teacher must so arrange his work that the student, not only helps conduct the class, but also develops habits of helpfulness and coöperation which will function latter in his civic, business, and industrial life.

J. E. Fintz, supervisor of vocational education, Cleveland, Ohio, spoke on "Class Size and Its Effect on Industrial Arts Teaching." He rehearsed the gradual increase of shop class size from 12 to 45 and even more students which has taken place. To meet this increase, he showed the development of worth-while instructional material, the use of special teaching aids, pupil personnel plans, etc., if the pupil is to be properly and efficiently taught.

Many of the industrial-arts teachers who attended the convention took advantage of the opportunities which Detroit offers in the way of industrial and educational establishments.

The industrial-arts and home economics exhibition, prepared by the Detroit schools and exhibited at the J. L. Hudson Co. store, was especially interesting. In many ways it was an almost ideal exhibit, showing, as it did, not only finished projects, but students actively engaged in working with hand and machine tools on things made of wood, metal, and other materials.

While the exhibit was large, every part of it had been assembled with the greatest attention to detail and simplicity. It was very much worth while, not only for the visiting teachers, but also for the citizens of Detroit, who

(Continued on page 13A)